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THIRTY CHAPTERS ON STATIC ELECTRICITY

SELECTED FROM THE ORIGINAL MANUAL OF

STATIC ELECTRICITY
IN X-RAY AND
THERAPEUTIC USES

BY

S. H. MONELL, M.D.

NEW YORK

NEW YORK
E. R. PELTON, PUBLISHER
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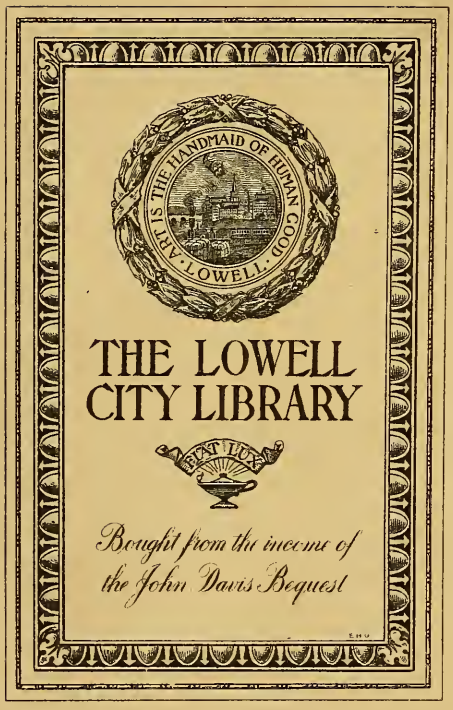
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PROFESSOR MONELL'S celebrated "Manual of Static Electricity in X-Ray and Therapeutic Uses"—*the book that made the author famous*—was begun February sixteenth, 1897, finished on March twelfth, went through four editions, and was sold out by us in July, 1901. Owing to the advances in X-ray work the publisher let the entire book remain out of print despite the continuing and increasing demand and the absence of any other satisfactory treatise on the subject. It has never been revised and no complete copy can be had. As the pioneer work of its kind in any language it won a remarkable recognition and became the most widely known exposition of static electricity ever published. But it is now history. It put the static machine for the first time authoritatively before the medical profession, and has made ten machines grow where one grew before. Yet no copy can be secured by any of the five thousand yearly graduates in medicine since it sold out. The original book contained fifty-seven chapters, 630 pages, and sold for $6.00 net. Those who neglected to get it when it could be had made a great mistake. Physicians have repeatedly offered us $10.00 for second-hand copies, and we have often advertised for them, but have been able to obtain very few.

For the accommodation of the many who need static literature we yield to the urgent requests upon us and herewith reproduce a part of the unaltered original Manual with limited author's notes.

E. R. PELTON.

NEW YORK, 1903.

PREFACE.

MEDICAL electricity has three great subdivisions, Static, Galvanic, and Faradic. The demonstration that the static machine affords the best means of exciting X rays within a Crookes tube gives it now an extraordinary interest to the physician and surgeon, and places it in the front rank of high potential apparatus.

In this volume the author aims to present in a concise and intelligible form the essential facts relating to static electricity and its successful application to the treatment of disease.

It will describe how to care for and operate the best type of modern static machine, and will set forth as clearly as possible therapeutic indications for the various methods of administering the currents which it produces. Lengthy descriptions of obsolete apparatus are entirely omitted in favor of the fullest practical account of clinical details.

The chapter upon X-ray methods describes in full the necessary static technique.

The therapeutic section of the book presents the clinical experience of the author and others and describes methods of treatment with painstaking exactness.

The static machine is now to be found in the offices of many physicians both in large and in smaller cities, and its use is not alone confined to special practitioners and institutions. The X ray is spreading it rapidly. As it has become better known it is more frequently employed, and each improvement in its construction has marked a new step toward a popular career.

In spite of its antiquity as a medical apparatus, it is but on the threshold of its real introduction to the profession at large. Those who have used it successfully during the past decade have rejoiced greatly at the advantages it has given them, but little or no effort has been made to develop its literature and spread abroad the knowledge of its usefulness.

On the contrary, it has been subjected to partisan and unreasonable criticism which has influenced many to question its practical value, and writings upon the subject have been exceedingly meagre.

The demand for a work of this character has been urged upon me by many who have sought in vain the desired facts in any single publication, and I have been persuaded by those who have read my various contributions to medical journals to undertake the task of placing before the profession a practical treatise upon static electricity.

The galvanic and faradic currents have been quite extensively written upon, and they not only furnish the chief theme of electro-therapeutic articles in the journals of the day but a considerable number of volumes describe their properties and uses. Various text-books upon materia medica and therapeutics also mention their action and accord them some space. Scarcely any such service has hitherto been performed for static electricity, and the disproportion between its worth as a curative agent and the extent of its literature is a remarkable anomaly.

It occupies a field peculiarly its own, in which it is unique. It is an ally rather than a competitor of other currents, and it constitutes another link in our chain of resources. No argument is needed now to support the right of static electricity to equal consideration and rank with methods in general use. Electricity is not hostile to any other mode of cure. All that electricity, and drugs, and massage, and heat, and cold, and hydrotherapy, and climate, foods, mental therapeutics, and surgery combined can do for suffering humanity is yet utterly inadequate to supply the demand for relief from pain and disease. The united forces of medicine need more help and not less. With this fact in view the author commends the fuller study of static electricity to the profession at large.

S. H. MONELL.

March 11th, 1897.

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CHAPTER III.

THE CARE OF THE STATIC MACHINE.

Proper arrangement of machine in office. How to keep the interior dry. Method of grounding poles and electrodes. Conduction from machine to patient. Care of case, oiling, and charging. Reverse of polarity and how to correct. Tests for distinguishing positive and negative pole. Operation of the static machine in summer. Motor. Attachment of belt, proper adjustment, cleaning, oiling, and precautions to avoid injury. Rheostat to regulate speed.

It is an important starting-point in the perfect working of the static machine that it should be properly set up in the physician's office. It should stand evenly and firmly upon the floors so that when in rapid motion it will neither jar nor shake.

If it is run by a motor, the belt should be joined by a small steel hook embedded into the leather and make no click when it meets the wheel. The plates, combs, collectors, and all the internal parts should be correctly adjusted so that none grate or rub upon each other. Without an accurate adjustment of the machine it cannot be expected to operate satisfactorily.

The revolving glass plates should turn evenly and smoothly, and when everything is in proper order the machine should be nearly noiseless when in action. In many respects the care required by a static machine resembles the care usually bestowed upon a choice piano.

It should be placed in a large and dry room. An inner room, or one in which the sun freely enters, is to be preferred. It should be covered when not in use, and should be daily dusted, and its metallic parts kept bright with a rouged chamois. The electrodes should be similarly treated.

There exists an active affinity between all parts of a static machine and the floating particles of dust in the atmosphere of

a room, and for this reason it should be protected from dust as much as possible.

Attention to these details will maintain the beautiful appearance of the machine and keep it from looking tarnished and neglected. The entire case, metal parts, platform, rod, and chains should be kept scrupulously clean.

When the machine is first purchased the external brass parts and electrodes will be found coated with shellac which is a bad conductor. It must be dissolved with alcohol and entirely removed from the sliding poles, rod, and metal parts of all the electrodes.

At the very commencement the interior of the case must be thoroughly dry and ever after kept so. The method of keeping the interior dry deserves special attention, for the successful employment of the machine depends much upon the absence of internal moisture.

During the seasons of the year when the atmosphere of the house or office is artificially dried by furnace or other heat there will of course be no additional necessity to dry the interior of the machine, but in summer when no fire is used and when the doors and windows are frequently open, every misty or rainy day will saturate the air of the house with moisture. This is the period of discontent for the static machine, but its evils are moderated by judicious care. Various expedients have been suggested to dry the internal plates, but one and all methods heretofore mentioned for this purpose should be discarded for the following plan, which is now universally adopted as the best.

Obtain two or four fire-proof dishes or bowls of common white crockery, not too large to enter the case, but sufficient to hold together ten pounds of chloride of calcium. It is furnished in hermetically sealed containers of ten pounds each. It is usually taken from the can and put directly into the machine by uninstructed operators, but this should never be done, for it is exceedingly hygroscopic and always contains more or less water when purchased. Unless this is first evaporated and the

chloride thoroughly dried it will liquefy more rapidly and be far less effective in the case.

Accordingly divide the contents of the can between the dishes and bake them in a moderate oven until the calcium is white as chalk. It may take but an hour or two, or an entire day, depending on the quantity of moisture to dry out and the relative heat of the oven, but bake it till it is thoroughly dry no matter how long it takes.

The heat should not be sufficient to boil the water (if part of the chloride is in a liquid state), or it will run over the edge of the dish and not only waste but necessitate cleaning the oven. Never let any liquefied chloride of calcium spill on a carpet or the floor of the office, for it is a disagreeable substance.

When an examination shows the baking to be thoroughly done remove the dishes from the oven to a suitable pan, cover them with a dry towel, carry them to the machine, and transfer them quickly to its interior. Instantly screw fast the doors. The machine will then be ready to operate.

The chloride of calcium may be rebaked as often as necessary, and by using dishes that can be put in the oven without injury the same material can be utilized again and again with very little waste. I use the same chloride for at least a year before throwing it away and procuring a fresh can. In the winter time it remains dry and is practically not needed within the machine, but I leave it there because it is the safest place to store it where it can be found. In the spring and fall seasons I take it out about once a month and in the worst of dog-days about once a week, but the actual state of the chloride is the indication for baking it again and not the lapse of any particular time.

The next and more important matter to attend to after a new machine is set up in running order in the office is to provide metallic groundings for both poles, and for the several electrodes.

Uninstructed operators often drop a chain from the sliding

rod to the floor, but the clinical results of such physicians are not always gratifying. When a current of electricity is conducted to earth it should be by a metallic route, and a high potential difference between the static poles depends upon good conduction, as well as upon the capacity and power of the machine. Static electricity has no fixed voltage. The operator controls it by his management of the apparatus.

Two separate groundings are essential. Without them the machine loses fifty per cent. of its efficiency. If the office contains gas and water pipes both, they serve the purpose. If not, the physician can drive two pieces of iron pipe into the ground deep enough to reach moisture, and connect these with convenient situations in his office by heavy copper wires. As there are few offices which do not contain running water and gas I shall proceed to describe how to employ them as groundings.

Procure a necessary quantity of stout copper wire. Tack a piece of it under the table of the machine and carry it along the baseboard of the room to the water pipe, to which the end of the wire should be permanently fastened. This is utilized for grounding one of the poles of the machine, by linking one end of a brass chain to it, and hooking the other end of the chain upon the sliding pole which is not connected with the platform during treatment. To remove the grounding after treatment simply unhook the chain from the sliding pole and hang it on a convenient peg in the wall, or drop it on the floor.

The gas fixture grounding requires no preparation if a chandelier from the ceiling is in convenient relation to the platform and is brass. If it is bronzed iron or some composition which is a poor conductor a piece of stout copper wire should be bent into a hook at the lower end and carried up the chandelier and twisted around the gas pipe at the top. If the chandelier is not conveniently situated, or does not exist at all, a copper wire can be run from a side bracket to some point where a hook at the end will be most handy for the operator.

The grounding of the electrode is accomplished by attaching the swivel of another brass chain furnished with the machine to the ring upon the metallic part of the electrode and hooking the opposite end of the chain upon the chandelier or wire connected with it.

No operator who has not provided metallic conduction to earth can create a high-potential difference between the opposite polarities, and therefore cannot equal the best therapeutic work of which his machine is capable.

After providing conduction for the indifferent pole and the electrode, the next step is to provide good and direct conduction from the active pole to the patient. Poor conduction in this respect is a fruitful source of failure. If the platform surface wastes half or two-thirds of the current before it gets from the end of the rod to the patient it must be furnished with a better conductor, for extravagance in current waste is fatal to therapeutics. New platforms are sometimes varnished, shellaced, or oiled, and shellac, varnish, and oil are all bad conductors.

An oak platform with natural wood surface is probably the best for static use and this can be dampened a little from time to time and its conducting efficiency increased. Metal, however, is by far the best, although in some forms of application it possesses drawbacks which require experience to overcome. By far the most efficient way to get a current directly into the patient is through a metal tray placed under the feet, or a chain or rod held in the hands. I habitually use a brass tray about fifteen inches square, to one corner of which is attached two feet of chain. When the rod from the prime conductor is placed upon the platform in the usual way the free end of this chain is thrown around it and direct conduction is secured.

As every screw about machinery in active vibration will tend to work loose, it is necessary from time to time to tighten the screws that close the doors and secure together the framework of the static apparatus.

Every joint about the machine must be constantly kept as firmly tightened as possible. Some of the internal screws will occasionally work loose and permit two plates to rub together, or a comb to scratch and grate upon one of the revolving plates. When this happens it calls the operator's attention to it by the noise it makes and the trouble should be corrected by removing a door, setting the comb or movable plate back into proper position, tightening the screw, and closing the door again. The case, however, should be opened only when absolutely necessary, and a dry day selected for this purpose, for it at once lets the air of the room into the machine and temporarily lowers its working capacity.

Very few parts of the improved Holtz machine require oiling. One of my former machines, with an axle bearing, required regular oiling through an external oil orifice at each end of the axle, but this method allowed some air continually to enter the case and involved an extra amount of friction. My present apparatus contains ball bearings enclosed in a permanent oil bath, with no openings to let in the air, and with the friction reduced to a minimum. These bearings constitute a great improvement in the apparatus and were introduced by the manufacturers at the author's request. As a veteran bicycle rider my familiarity with the advantages of ball bearings induced me to repeatedly urge their merits upon the makers of the Holtz machine.

Charging this machine simply involves the principle of joining by metal conductors both poles of a frictional machine, which will develop electricity by friction in all atmospheres, to the two poles of an induction machine which will develop nothing until the germ of the current is supplied, setting both sets of plates into action, and continuing until the induction plates take up the minor frictional discharge and magnify it into a high-potential current.

The process may be instantaneous on a dry day, or may require a dozen seconds under ordinary circumstances. A good

deal depends on the dryness of the chloride within the large machine and on the efficiency of the small frictional apparatus. On a damp summer day I have seen a small charger that was out of order consume half an hour in charging the induction plates. A charger that will give only a quarter of an inch spark between its two poles will be very apt to do this. The charger within my present apparatus is constructed in a much better manner, with larger plates and better workmanship, and will give a one-inch spark. Its action is successful, convenient, and satisfactory.

The static machine occasionally reverses its polarity. To prevent this occurrence Holtz introduced his ingenious diagonal conductor, a device which does not fully remove the fault though it greatly increases the stability of the electrical charge. When this occurrence takes place in practice it is only necessary to become aware of it and connect the platform with the desired pole for therapeutic effects, provided that no inconvience to the operator results from the reversal.

Sometimes, however, owing to the situation of available space and the relation of office accessories, it may be a practical necessity to have the positive pole always at a particular end of the machine, where the physician becomes accustomed to its use with the most satisfactory convenience. This being my own case a few years ago, a reversal of polarity operated as a decided hindrance, and I therefore investigated the conditions which appeared to influence the shifting charge, with the result that I discovered a method of correcting the reversal and described the same in the *Medical Record*, February 24th, 1894.

Thoroughly discharge the machine and subject the plates to a sharp jar in some manner that is consistent with safety to the apparatus. With a six-plate twenty-six-inch machine the simplest method of doing this is to lift the positive end of the case a very short distance from the floor and drop it, using the precaution to avoid any damaging violence. An eight-plate thirty-inch machine is rather heavy to lift.

Other methods are: Strike a few sharp taps with a hammer on the outer end of the brass cross rod supporting the upper set of diagonal combs, jar the case by blows upon its floor or side, etc. With care no damage whatever will be done the machine.

To demonstrate success, recharge the plates and if the positive has not yet shifted as desired try it again. On a good day for static the charge is sometimes more tenacious and the object is not so readily accomplished. It then simplifies the matter to open both doors and discharge the machine more thoroughly.

To discharge the Holtz machine when desired, revolve the plates backward until no spark will pass between the sliding poles when they are brought gradually together until they touch. Then touch each prime conductor with a grounded electrode and start the machine into action in the usual way. If the machine is discharged it will now produce no current. If the attempt to discharge it has not perfectly succeeded try it again. I kept a record during one year showing that my machine reversed thirteen times and each time I corrected the change by the method above described. It sometimes took me only a moment and once or twice it required half an hour to restore the desired polar relations. In my present office I have abundant room and need make no attempt to correct reversals.

When the machine is not in action the poles should always be left some distance apart. If they are short-circuited by being placed in contact after the machine is stopped it tends to cause a discharge and require recharging the next time a patient is treated, although the state of the weather will affect this somewhat.

The physician operating a static machine must at all times know which pole is positive and negative as certainly as he must distinguish between the poles of a galvanic battery. Both my ear and eye have become so trained to the action of static currents that I am always aware which pole is being employed without making any actual test to discover. The difference be-

tween the two is manifested in many ways. To make a direct test, put the poles one or two inches apart and start the machine into slow action. Watch the poles and the first spark will be seen to jump from one ball to the other.

If this is detected by the eye it instantly shows that the pole from which the spark jumped was the positive.

With the spark stream now in full and continuous action it will be seen to be a violet tint for nearly half its length at one end and bright at the other end. The violet tint shows the negative pole, the white light shows the positive pole.

Also pull the rods slowly apart until the brush discharge between them splits. From the positive pole there will be a single straight "handle" from the brass ball to the brush, while the negative end will have no defined and single "handle." Draw the poles still farther apart until the brush divides. With a good machine, a dry room fairly darkened, and a high speed of the plates, the famous fox's tail will flare in splendid radiance between the poles. It never remains upon the negative.

If none of these several steps of an ordinary test satisfy the beginner who has not yet acquired the confidence of experience, place the sliding poles about six inches apart or so that the discharge between them is a compact stream instead of a scattered brush.

Ground the brass point electrode and put its point in the course of the spark stream at either pole. It is obvious that interference with a jet of water at its terminus will scatter but not abolish the jet, while interference at its source will deflect it or even stop it altogether. As the current passes from the positive to the negative the grounded electrode placed at the positive pole will completely abolish the spark stream by conducting it away. If the electrode interferes at the negative pole the spark stream will persist from its positive source and will be affected only at its terminus.

With a small machine and a moderate current this latter test is easily made with a match held in the hand, as I have formerly

described; but with a powerful machine and a strong current the electrode is a more agreeable means.

Operation of the Static Machine in Summer.—I have often been spoken to by physicians about the trouble they experience in getting an adequate current into the patient during rainy seasons in July and August. In some cases their machine gives a good discharge between the sliding poles, but little or nothing reaches the patient.

It is difficult to say at a distance what may be the cause of the trouble in any given case. Non-experts sometimes think their machines are in perfect order when they are actually the reverse. They may also regard the conditions of the room favorably when the trained operator of static apparatus would at once detect a weak point.

If the machine and room are dry and in good order the work done in July and August should rarely disappoint. In my own case I have entire confidence that my machine will work on every day in the year, for if it fails for a moment I speedily correct the trouble. The mastery of the conditions which enables me to do this can be acquired by other physicians without a doubt. I have never failed to quickly discover the cause of defective action in the case of machines in other offices when I have been able to make a personal examination, even through previous correspondence failed utterly to suggest the trouble.

It should be remembered, however, that few owners of static machines have been carefully instructed in their management. They have usually bought an apparatus and picked up haphazard their slender stock of knowledge about it. The machine is far too valuable to be viewed in an indifferent manner and it will well repay the time and cost to procure the best instruction possible.

Motor.—The consideration of motor power in connection with the static apparatus is quite important. Physicians in different localities have different methods available. Some will find it necessary to employ water as the power. Some have

put in small gas engines. Some engage a boy to turn the machine. But wherever an electric street current is available an electric motor is the most satisfactory method.

A primary battery for power is out of the question, and secondary cells would be inconvenient, expensive to operate, and are also practically out of the question at the present time. When an alternating current runs through the physician's street there is, I am informed, some difficulty in obtaining a small motor that it will operate with satisfaction. The direct 110-volt current is available in many places, and, as my personal experience is limited to this current, I will describe only what I employ myself.

I have a one-sixth horse-power Crocker-Wheeler motor. A one-eighth or even one-twelfth horse-power will run a static machine in perfect order, in perhaps half of its work, but as time goes by, and the plates may sometimes rub against each other and greater resistance may develop from other causes, it is wise to have some power to spare, and for this reason a one-sixth horse-power motor is always preferable.

I employ but a single belt, running directly from the central shaft to the motor. My machine has no fly-wheel, but the Wimshurst charger is operated by hand with superior convenience whenever it is needed. The use of the fly-wheel to operate both the charger and the larger plates involves some minor drawbacks. The additional friction is something, but the wobbling appearance of the revolving wheel, which is almost always in the eye of the patient and the physician, becomes very unpleasant to any one who is accustomed to an invisible mechanism.

I regulate the speed of the motor by a rheostat which was made especially for me. It has a resistance of 125 ohms, divided into 25 steps, so that the switch gives very even gradations of speed from the maximum down to a complete standstill.

When the machine is not in action the current should not be left passing through the fields of the motor, but should be

switched entirely out of circuit in the way that an electric light is cut out. I have such a switch attached to the wall near my machine so that when not in use no current enters either the rheostat, the motor, or the flexible cords, and all danger of heating is eliminated from the portion of the circuit which is inside the office.

A new motor will almost always give a little trouble until it gets settled to working order. It must receive sufficient, but very simple, care. The oil cups will need filling once in about two or three weeks. Whenever the commutator becomes blackened it should be made to revolve while a piece of OO sandpaper is held against it to remove the carbon. If too much oil is put in the bearings it will at times work up on the commutator and must be wiped off with a clean rag.

It is of the first importance to have the brushes in proper relation to each other, and to the centre of commutation, in a given motor. These centres differ in different types, and ordinary electrical workmen who simply wire houses for bells and lights are almost always ignorant about the adjustment of a motor, and will leave the brushes in a position that will encourage heat effects and possibly sometimes ruin the motor coils. I speak of this because of a personal experience with the ability of workmen to botch a job they do not understand.

If, when the motor is put in position, the wheel revolves the wrong way, it can be reversed by simply transferring the two short wires which connect its opposite poles.

Whenever the belt stretches it should be promptly tightened so that it will not slip on the small wheel.

Those who may order a rheostat for the control of a one-sixth horse-power motor would do well to specify a resistance of 175 ohms instead of 125, and the higher resistance will give control over the speed when the machine is short-circuited and running without resistance. I employ a bank of lamps for this purpose, but when the apparatus is all purchased at once the rheostat can easily include all the resistance that may be needed.

AUTHOR'S NOTES.—The main revision needed in this chapter is in respect to our treatment of the necessary and indispensable chloride of calcium. Previous to writing this book most of our experience had been obtained with small machines and the custom of using a small amount of chloride was in general vogue. We very soon learned the far greater value of large quantities of the dry salt, especially as our machines grew in size to our present case. Ten pounds is too little for even the smallest machine now made. Use from thirty to sixty pounds, according to the dimensions of your case. By this we mean from three to six of the customary ten-pound cans furnished by dealers, for the actual weight of the salt when dry will be less than when wet and it need not be weighed for the above purposes.

Do not use glass or crockery dishes, as they crack with heat after some use, if not the first time. Enameled or "agate-ware" dishes as deep and large as will fit in your machine without attracting sparks from the internal mechanism are far the best, and we have used them with entire satisfaction since 1898. The chloride need not be thrown away after long use, as remarked on page 44, but will last for years. We have found by experience that it is as good as new every time it is baked out hard as a kiln-dried brick, no matter how old it is. We no longer throw any of it away.

It is also a mistake to remove the chloride from the case at any season of the year. Tests fully prove that no matter what the season the current is enhanced from twenty to sixty per cent by the aid of chloride as we now use it, and the only exception to this rule will be upon the few rare days of winter when the tonic crispness of the air is at its height.

On page 45 we find the statement that "two separate groundings are essential." By this we simply mean that for convenience we should have at least two places to work with, one handy for each end of the machine. From either a water-pipe connection or from a gas pipe we can run copper wire terminals to as many places in the room as may suit us for our work, and

from them we can select the most convenient hook for the given pole or electrode used for a given treatment. When the original text was written we had not learned how to manage grounding connections quite as well as we have learned in the six years since, and if we possess one metallic path to moist earth we can easily make branches with copper wire and chain to accommodate each end of the machine and all our positions during treatment. But a *grounding* is absolutely essential. No operator can do good work without it. It is a very feeble substitute to drop the end of a chain on the floor and leave the high resistance of the dry wood or carpet in the circuit.

On page 48 our old remarks on reversal of the charge may be considered obsolete. Both the Toepler and the Holtz type of machine will reverse frequently if damp or improperly cared for, and both will maintain their polarity with very steadfast persistence if our directions for using a large quantity of chloride are carried out. A dry machine rarely reverses. To correct a reverse we use a Leyden jar as described on page 235 in our little book entitled "Elements of Correct Technique." It is now so long since we used a small machine that the directions at the foot of page 48 awaken a smile. They worked all right, however, for a number of years in our early experience, and are harmless even if not up-to-date.

The subject of motors now needs little place in this book. Dealers supply what is best suited to their apparatus and the power available for the physician. There has been great improvement in these accessories since 1897.

CHAPTER IV.

THERAPEUTIC METHODS.

Necessary electrodes. The importance of a proper platform. Leakage. Positive electrification. Negative electrification. Potential alternation, technique in full. Positive static breeze. Continuous and interrupted methods of administering the breeze. Negative static breeze. Positive or negative static spray. The static cage. Its action as an electrode. Methods of use in full with both oscillating and continuous currents. General indications for the use of the static cage. Static sparks, frictional and percussive. Leyden-jar currents.

THIS subject must be considered of the utmost importance to the physician, and it is my purpose to treat the matter as fully and plainly as can be done in writing.

The accessories desirable for such a therapeutic Holtz machine as the author employs are: One long brass rod to connect the prime conductor with the platform; three long brass chains; three pairs of Leyden jars, small, medium, and large; an adjustable and movable standard for supporting a stationary electrode; a swinging brass rod attached to top of the case for head-breeze administrations; separate electrodes with hard-rubber insulating handles—brass spark ball three inches in diameter, a small brass spark ball three-quarters of an inch in diameter, a spark electrode within a protecting glass shield, single brass point; a multiple-point electrode of long fine needles, preferably copper; wooden point, wooden ball, massage roller, hard-rubber handles for Leyden-jar electrodes. Conducting cords and all varieties of electrodes employed with coil currents are available for Leyden-jar currents, and no special electrodes are required.

The great variety of effects obtained from static currents are to be produced by the great variety of practical manipulations

of current strength, conditions of treatment, and a few essential electrodes, rather than by multiplying the number of electrodes.

The traditional umbrella crown electrode is superseded by a small group of pointed and fine wires bunched together. This produces a concentrated head breeze instead of the diffused scattering of the current caused by the umbrella. As a practical electrode the large, clumsy, but time-honored umbrella is contrary to the established principles of therapeutic breeze application.

The improved platform of to-day is the most essential accessory accompanying the static machine. The ordinary size is forty-two inches long by twenty-seven wide and is supported a foot above the floor by solid glass legs. All corners and edges are rounded. The early, square-edged, sharp-cornered platforms, with wooden legs set into common glass cups, leaked off a large amount of current, and are obsolete. All who are still using such an inferior platform should procure a better one. I have seen men who deemed themselves very experienced with static electricity still use one of these worthless and long since rejected platforms, without realizing that they were wasting half the current that should have reached the patient. A good platform that will insulate the patient effectively is a cheap investment and an absolute necessity.

The author's insulated electrode handler is also a practical requirement for the physician.

Another extremely important accessory part of the static machine is the means of connecting the Leyden jars with the prime conductors. In one of my former machines these hooked directly upon the pole piece, and the hard-rubber supports for the sliding rods were solid at the base, and allowed little leakage. My present apparatus, however, was fitted when first purchased with a jointed rod device, and instead of being solid, the hard-rubber knob beneath each pole piece was open at the bottom and fitted with a brass screw, into which the jointed rod was secured. The result was found to be a leakage so great

as to be fatal to X-ray work with tubes of high resistance, and to reduce the therapeutic efficiency of electrification by at least one-fourth.

So great was the leakage that it was impossible to procure between the sliding poles the splendid luminous displays and "fox tail" or whisk broom, which ought to be visible at the positive pole in a dark room. It is wise to speak of this point because a number of physicians may be employing a similarly constructed apparatus without suspecting the reason why they cannot equal reported results. This defect has since been corrected, and can be rectified upon any apparatus of this kind in use.

Physicians accustomed to the administration of electric currents created by chemical action are somewhat confused when they first attempt the different applications of static electricity, which will now be explained in detail.

Positive Electrification.—Seat the patient upon the platform, with the platform related to the machine so that the brass rod will conveniently reach from its nearest side to the prime conductor.

It should not be under a gas fixture, or within a couple of feet of other office furniture, and as a general rule the more free room around the platform the better.

The side of the patient nearest the machine should be two feet or more from the grounded pole, or otherwise a strong current, woollen garments, and the negative attraction may annoy the patient with an irritating breeze.

In hooking the "shepherd's-crook" rod over the positive pole it should be hooked with the ball extremity uppermost, and close up to the large ball of the prime conductor, to prevent leakage. It is usually thrown over the rod in a careless manner with the ball projecting downward and toward the machine. This is a bad method and wastes the current. The "crook" at the end of the platform rod should be bent for practical use until the ball and the neck are within an inch of each other.

As usually furnished by makers it is an ornamental but not practical shape.

Hook upon the negative pole of the machine the free end of the brass chain which has already been linked to the copper wire passing from the baseboard to the water pipe or gas fixture. This grounds the negative pole.

Place a metal foot-plate, or tray, under the patient's feet, and connect it with the lower end of the platform rod by a piece of chain attached to it for this purpose.

In this application, and at all times whenever any ordinary form of treatment is given upon the insulating platform, the sliding poles of the machine are to be drawn their full width apart. They are only brought near together when Leyden-jar currents are employed, or localized Potential Alternation.

Next, start the machine into action and cause the plates to revolve as rapidly as they can without either racing or sparking within the case.

In dry, wintry weather a highly insulated positive pole will sometimes drive sparks between the metal parts within the case and startle a timid patient. Reducing the speed of the machine will avoid this, but it should be remembered at all times that simple general electrification requires a maximum current strength for maximum beneficial effects.

If no local or other application is made at the same sitting positive electrification is usually maintained about fifteen minutes, but often requires a longer time for full effects.

Negative Electrification.—Each step of the process exactly repeats what was done for positive electrification except that the rod is hooked to the negative pole and the grounding chain is hooked to the positive. The machine never sparks back with this low potential polarity, and the patient may either sit with feet upon the tray or hold the rod in her hands, while a maximum current is maintained. There is no liability of causing irritation through woollen garments by the attraction of neighboring objects.

Potential Alternation.—The above two methods are a continuous general electrification. Potential alternation, as described by the author in 1893, constitutes an interrupted and oscillating, vibratory, general electrification. It may be considered as adding force to the continuous current, something as a hammer blow adds force to continuous pressure, and is a more energizing tonic than the primary method.

Either remove the patient's shoes and place the stocking feet upon a reservoir electrode filled, for comfort, with warm water, or, if this is too much trouble with high-laced shoes, leave them on and insulate the nails in the heels by putting three or four folded newspapers between the shoes and the metal foot-plate.

If shoes are worn without such protection the interrupted current will pass up the nails, and through the soles of the shoes, in a succession of sparks, and the tolerance of the feet would not permit the current to be made strong enough to affect the rest of the body.

Next prepare the platform rod the same as for simple positive electrification, and ground the negative pole. Fix the large brass ball spark electrode upon the movable standard and place it beside the positive prime conductor so that the balls of the electrode and the "shepherd's crook" will touch each other. Ground the electrode to the gas fixture if the negative pole is grounded to the water pipe. Different groundings in this case are essential.

Over the head of the patient arrange the head-breeze electrode, and attach to it the same chain which connects the negative pole to the water pipe. Adjust the head electrode so that it shall be about three feet distant from the patient.

Start the machine into rapid action and gradually draw the ball electrode away from the shepherd's crook so that finally the length of spark which passes between the two will cause a gentle thrill that does not exceed comfort in the patient's feet; at the same time, vigorous oscillations will be seen in the patient's hair.

The cut occupying this page in the original edition is so obsolete that it is omitted. Most of the illustrations of 1897 are omitted, as they are too inferior for to-day.

The operator may use a single hand to move the spark electrode. Never touch the standard with both hands while the long spark is passing.

The patient must keep both feet flat in contact with the platform. If one foot is lifted the density doubles as the contact area is divided, and hence a current strength that is proper for this treatment might be exceedingly disagreeable if concentrated upon one foot.

I am often asked what should be the length of spark between the interrupting electrode and the positive pole. Spark lengths will vary according to conditions, and the dose is not regulated by inches. Oscillations should be obtained which will set the atmosphere and hair of the patient in that degree of powerful commotion which, in a given case, experience demonstrates to produce the most sedative-tonic effect. As a matter of fact the spark streams, which I have often measured to gratify inquiring physicians, have varied from three to seven inches in length, with an average, probably, of about five.

The same method can be pursued with the negative pole, but the high potential polarity is more effective and hence preferable.

Positive Static Breeze.—Arrange patient and machine attachments the same as for negative electrification, and ground the positive pole to the wire near it, which has previously been brought from the gas fixture to a situation near the machine, convenient for this purpose.

The breeze may apply a continuous or an interrupted current and the electrode may be in motion or stationary.

For a stationary breeze upon the head, forehead, occiput, joint, or any localized part of the spine or body, fix a brass point electrode upon the standard and set it at a proper distance from the part to be treated.

For a vertex head breeze, simply swing out the hinged rod screwed upon an upper corner of the case of the machine, and suspend the small bunch of wires, elsewhere alluded to, over

the patient's head—twelve to twenty-four inches, according to the thickness and resistance of the patient's hair and the effect desired. For this purpose my own special head-breeze electrode consists of half a box of exceedingly fine, French gilt hairpins which I wound together at the top with a small piece of wire, flared the points slightly apart, and suspended them by a foot of copper wire to the extremity of my swinging rod.

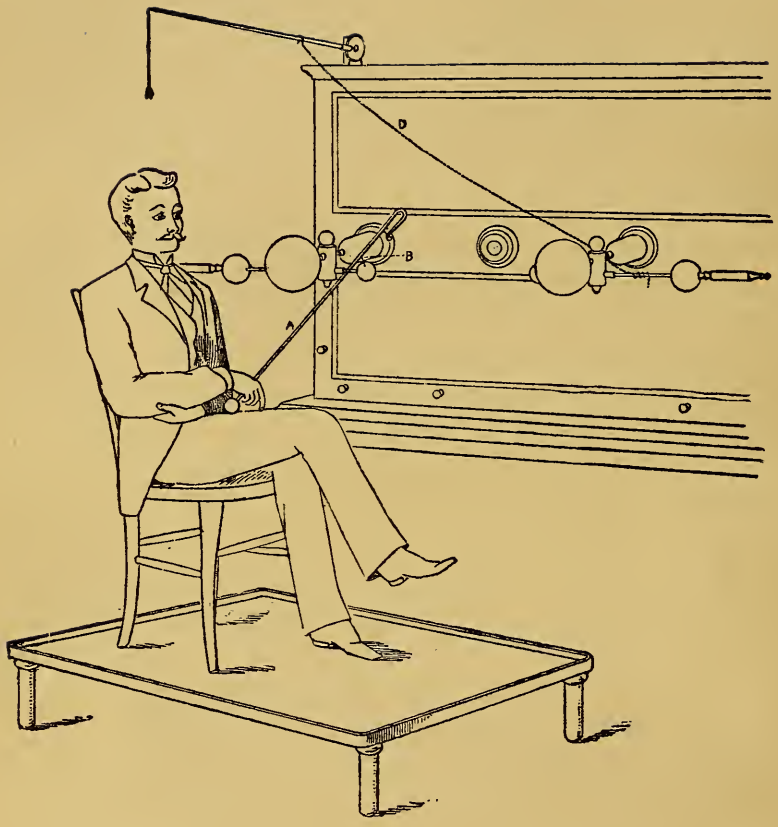
When all is ready ground the electrode to the gas fixture and start the machine into action.

Regulation of speed, distance from point to patient, length of application, and all that constitutes the dose, depend upon the therapeutic indications and call for operative skill on the physician's part.

A moving positive breeze is administered by attaching the brass point electrode to a chain, hooking the chain to the gas fixture, and manipulating the point with rapid or slow sweeping motions, at greater or less distances, over a given part, according to the effect desired.

To apply either a stationary or moving breeze in the most effective manner the method taught by the author of interrupting the current before it gets to the patient is superior to the method sometimes employed of interrupting the breeze on its way to the earth. This latter method adds no efficiency to the treatment, although it will eliminate the irritation of a negative head breeze upon a thick head of hair, or through woollen garments upon other parts of the body. The author's method, however, not only eliminates negative irritation, but tremendously accelerates the current force with which the patient is electrified. This is one of the rudimentary things I demonstrate to all my students. All other steps of the process are the same as for a continuous breeze.

To cause the interruption the patient holds the platform rod in her hands, rests the crook conveniently upon the frame of the case, in such a way that the rod can be steadily and easily held at the distance of an inch, more or less, from whichever



Author's Interrupted Head Breeze. *A*, Rod connecting patient and platform to positive pole; *D*, chains connecting head-breeze electrode with opposite pole and passing on to the usual grounding. *A* rests upon the side of the case and is separated from the prime conductor by about three-quarters of an inch. The dotted lines *B* indicate the spark stream which passes between the rod and the prime conductor to interrupt and modify the breeze application. The principle is the same with either pole, but the positive head breeze never requires interrupting.

prime conductor is chosen for the treatment. A spark stream will pass between the pole and the rod as soon as the machine is started into action. The plates should revolve quite rapidly, and by increasing or decreasing the spark gap, the interruptions may be made either slower or faster, milder or more vigorous, and the intensity of the treatment regulated. Further regulation is attained by varying the speed of the plates and the distance between the electrode and the patient.

Negative Static Breeze.—All that has been said about the method of applying the positive breeze equally describes the negative breeze administration, except that the high potential positive pole must be connected with the platform. Electrodes are grounded and manipulated in the same way as before, with only such differences as the more irritating qualities of the strong negative breeze through resisting garments require. It is not irritating through cotton fabrics or on bare skin.

Positive or Negative Static Spray.—Spray applications simply intensify either the continuous or interrupted static breeze by throwing from the point of the electrode manipulated by the operator a convective shower of visible electrified particles of air.

For this purpose the electrode must be swept sufficiently near the patient, and the development of all the useful sedative, tonic, stimulating, counter-irritant, and rubefacient effects of which this method is capable calls for familiarity with the physiological actions of static electricity, and considerable experience and operative skill.

Massage Roller Applications.—The regulation of intensity and muscle effects with this method depends upon the distance between the two sliding poles, which are first brought near together and gradually drawn apart to increase the current strength.

The electrode is connected to a chain in the usual manner. It may then be employed with the following variations:

1. Attach the chain to either the negative or positive pole,

apply the electrode to the insulated patient, and ground the opposite pole.

2. Connect the platform and the machine with the rod as usual, and attach the electrode to the opposite pole, which is also grounded.

In the above applications the selection of poles is the same as for the static breeze. If the patient is connected with the positive pole its higher voltage gives greater intensity and heating and counter-irritant effects.

The poles may also be drawn wide apart and the electrode manipulated by the patient over the affected part while the operator interrupts the current with the spark-ball electrode upon the same prime conductor.

The roller may also be used with the Leyden-jar current by placing the bare feet upon a foot electrode connected with the negative Leyden jar while the operator passes the roller over the surface of the body. In this case the roller is connected with the positive Leyden jar and the strength of the application is regulated by the distance between the sliding poles.

These applications are nearly the same as the short frictional spark when counter-irritant effects are produced, but can be made to equal a slowly interrupted current to exercise muscles in a manner similar to massage.

The Static Cage.—This, when brought to general notice by descriptions in medical journals, has excited the interest of physicians, who presumed it to be either a new method or a method producing exceptional and superior effects.

The application of the static breeze to the head and spine, or entire body, by a breeze electrode fixed above the patient upon a standard, or by the brass point electrode manipulated near the patient by the hand of the operator, is about as old as the static machine. It has been practised nearly a hundred and fifty years. It is a utilization of the law that opposite electricities attract each other, and is a means of increasing the rate of change in the patient's positive or negative charge, or of local-

izing the area of diffusion from the entire body to a part upon which effect is concentrated.

When the point electrode is held near any part of the body it rapidly attracts off the insulated patient's electric charge, and is felt as a breeze upon the surface; and when the principle of the point as an attracting magnet is amplified by multiplying the number of points, arranging them in a circle surrounding the patient's body, or suspending them like a canopy above the reclining person, the result is a diffused breeze upon a large area instead of a concentrated breeze upon a small area.

When this method was first brought to my attention in 1894 it was stated to involve a process of auto-induction; inductive currents being set up in the patient's body by the surrounding "solenoid." A single personal experience disclosed at once the error of this view and revealed the cage as simply an expanded breeze electrode. Those who wish to make one can easily do so at a small expense and use it when it may serve. No exaggerated value can be attached to it, but it lends variety to methods which accomplish about the same result.

The indications for its use are general functional neuroses and diseases associated with perverted nutrition.

It is constitutional rather than local treatment and adds rapidity to the rate of change (current flow) of general electrification.

The cage may alarm very timid or hysterical subjects, and may be inconvenient to use upon some others. It is best adapted to men, or young girls or women who are rather trimly dressed, and who can easily stand within the cage in the required manner during the ten or more minutes of the application.

The effects parallel those attributed to high-potential currents of high frequency by French investigators during the past four years. The expert can vary the cage application in a number of ways, and interrupt the current by approximating the sliding poles, or by the author's method of potential alternation. In

ordinary hands, however, the methods which are simplest and serve every purpose are the following:

1. Negative electrification with either constant or oscillatory positive breeze.

2. Positive electrification with oscillating breeze.

Have the patient remove shoes and stand in stocking feet upon the reservoir foot electrode, which should be filled with warm water as a matter of comfort, for a cold foot-plate is disagreeable to most persons in cold weather.

From this electrode, connection is made to the platform rod and prime conductor of the machine. The rod is placed upon the platform in the usual manner. The cage is now lowered over the patient so that he or she stands in the centre, with a distance of about six inches between the top of the head and the chains suspending the cage.

The prime conductor not connected with the platform is both grounded and connected with the metallic cage by the usual grounding chain, passed first over the sliding pole and then hooked to the cage.

The sliding poles are short-circuited, and the machine is now started into action. The poles are next drawn apart about one inch. The exact distance is regulated by the sensation in the patient's feet, which should not exceed an entirely comfortable thrill. If drawn too far apart the spark stream will cease to pass between the poles, and this fact also requires that they should be kept near together.

This constitutes the oscillating breeze, and may be administered for five, ten, or more minutes, according to the operator's judgment. The technique is the same with either pole. With the negative charge it is bland and cool; with the positive charge it is more irritating or stimulating if garments make it so, but both can be made agreeable to the patient.

It is well to test the milder negative electrification first, as patients may be so dressed that the positive charge and negative breeze are too irritating to the skin beneath their garments

This is most likely to be the case with loosely woven, woollen fabrics, metallic hairpins, metallic dress trimmings, and corset steels, and no one should treat a patient with the negative breeze until he has familiarized himself with the sensations set up by different dress goods of higher or lower resistances. The removal of the outer coat often corrects the trouble.

The oscillatory application requires the passage of a stream of interrupting sparks between the prime conductors of the machine and is the most effective tonic manner of using the cage. The author's method of potential alternation, however, practically furnishes the same effect in a simpler way and obviates the necessity of employing the more troublesome electrode.

To produce a simple breeze it is only necessary to draw the poles apart at the beginning instead of sliding them together. The current is then continuous, instead of interrupted, and does not differ except in the size of the electrode from any other continuous static breeze.

The cage is a "general-electrization" method, and applies to the usual range of cases in which static electricity is of recognized benefit, particularly functional nervous disturbances, and is a sedative or stimulating tonic. It is not especially suggested in the therapeutic, itemized paragraphs of this book, for the reason that few possess the appliance, and those who do can readily comprehend its uses and employ it as opportunity permits.

Positive Static Sparks, Frictional and Percussive.—Arrange patient and machine attachments the same as for negative electrification and ground the positive pole to the conducting wire from the gas fixture, or to the chandelier.

Take in hand the large brass ball electrode, attach to it the swivel of the author's insulated electrode handler, hook the opposite end of the chain to the gas fixture, and with a quick stroke throw the ball so near any selected part of the patient that a single, thick, long spark will pass. Instantly withdraw the electrode.

Repetitions of this act, following each other with greater or less rapidity, constitute a spark treatment. Operative skill and judgment regulate all that pertains to dosage in the usual manner.

The short frictional-spark application is quite the opposite of this, and is made by rapidly rubbing the ball electrode over the surface of the patient's clothing so that the current will pass through the resisting medium in a fiery trail of sharp, needle-like, minute sparks, as long only as the garments are thick.

The percussive spark may be almost any length from one to six inches, and is a single discharge. Frictional sparks are multiple, and from one-quarter to one-half of an inch only in length.

A second method of producing a similar trail of pointed darts consists in sweeping the brass point electrode nearer the patient than in administering a static spray, and thereby throwing a shower of fine sparks as the point is swept across the surface. The brass-point electrode can be made to apply a breeze, spray, frictional sparks, or single percussive sparks, with equal effectiveness if the operator knows how.

Leyden-Jar Currents.—We now leave behind the applications of static electricity which are without parallel methods in therapeutics, and enter the field occupied by currents from induction coils, long known as faradic.

A pair of Leyden jars of one of the three sizes accompanying the machine is selected and placed in proper relation to the prime conductors. The sliding poles are brought together. A pair of the usual conducting cords is connected with the Leyden-jar attachments, and the free ends of the cords are attached to any form of electrodes employed with interrupted currents. The electrodes must be moistened if they are covered with sponge or felt. They must be placed in actual contact with the skin, and, so far as relates to disrobing the patient and manipulating the electrodes, the employment of Leyden-jar currents is the same as the employment of faradic currents. The platform

is not used. There is no insulation. The current is condensed within the Leyden jar, and discharged from it to the patient, in a more or less rapid series of discharges, which are regulated by the operator. The outer coatings of the jar must not be connected by the rod which joins them for sparks.

A closed circuit of current flow is established when the electrodes are both in contact with the patient.

A slow revolution of the machine causes sparks to pass slowly, and, if the electrodes are applied to muscles, will set up slow contractions which are marked by great energy and painlessness. The poles may be sufficiently separated to obtain the desired dose, but will exceed tolerance if too long a spark is passed. A range of one-half to two inches covers about the current strengths employed. When the plates are more rapidly revolved, the effect varies exactly as faradic currents vary with the rate of interruption.

Rapid revolutions and a rapid stream of sparks produce a high-tension current, which may be increased or diminished in strength according to the distance between the poles. A chapter might be devoted to this current alone if its various uses were described, but as it would chiefly repeat what is said in the author's work on "The Treatment of Disease by Electric Currents" of the application of all other induction currents, a full account would be superfluous. Suffice it to say that it is employed precisely as faradic-coil currents are applied, and not only may duplicate in the hands of an expert every external application customary with faradism, but goes beyond the latter in some of its effects.

The portability of the one and the cumbersomeness of the other apparatus, as well as the independence of coil currents to atmospheric influences, prevent, of course, the entire substitution of the static machine for both faradic and sinusoidal apparatus, notwithstanding that, so far as mere ability to obtain effects is concerned, the static covers about the same range as the other two.

In addition to the usual regulation of dosage when electrodes are attached to terminals upon the machine, a shunt may be em-

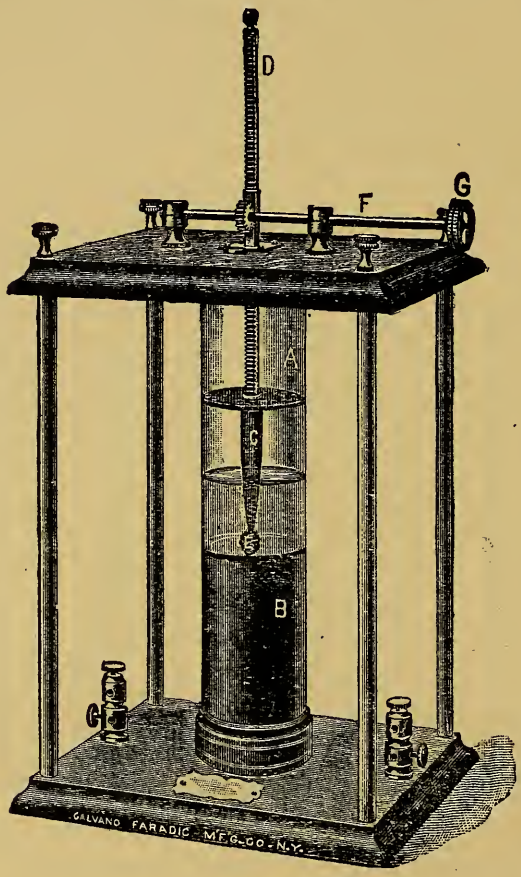


Fig. 1.—Leyden-Jar Current Controller.

ployed and current strength controlled on the reverse principle of the ordinary rheostat.

AUTHOR'S NOTES.—Experience teaches us that the accessories of a static machine are just as important a factor in securing results as is the machine itself. Inefficient platform, electrodes and connecting attachments will not enable the physician to do the best kind of therapeutic work on his

patients. Every operator should see to it that he has the correct design of electrodes, and a sufficient variety of them to cover his needs. Less than one-fifth of those using static machines possess adequate accessories of standard size, shape, and construction. Each physician can remedy this himself by procuring what he lacks.

The general teachings of this chapter require little remark save that they now seem primitive and limited. They were written from the standpoint of small machines, and as many doctors still use apparatus as modest in size and efficiency as we ourselves employed six and ten years ago, we shall not alter them to suit the large currents of our present practice. It must be understood by our readers that this whole work of 600 pages was written in the days of primitive electro-therapeutics, and before we had arrived at our expanded knowledge of the real scope and practical capacity of heavy currents from large static machines. On looking over the text for the first time since it was written we are struck by its primitive character, and wonder as we recall the many early charges of exaggeration against the author. So far from being exaggerated we think it safe to say that the entire book as a whole falls forty per cent behind a true statement of the work we have accomplished in our private practice since it was written. If there are any who cannot yet equal the moderate results reported in the original of this book we certainly are sorry for their patients and would urge them to improve their technique.

In order to assist the author in preparing important statistics regarding the development and present use of static electricity in the United States, every physician who sees this chapter is requested to write the author the number of revolving plates in his machine. Also to kindly give the names and addresses of other physicians of his acquaintance who have static machines. This will greatly oblige the author. Simply address him at "New York City." No street address is required.

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CHAPTER V.

PLATFORM METHODS IN GENERAL.

Principles of current accumulation for therapeutic uses. Arrangement of patient on the static platform. Therapeutic actions of general electrification. Its sedative-tonic effect. The therapeutic choice of poles. Polar differences relate to voltage rather than chemical action. The therapeutic actions of breeze applications of all varieties. The influence of clothing in modifying the breeze. Precautions to avoid annoyance to patients. The therapeutic action of static sparks. How to modify the spark. Precautions to avoid discomfort to patients. Anatomical localities to be avoided in giving sparks. The technique and action of "friction" sparks. Counter-irritant effects. The therapeutic action of "potential-alternation" method, both general and local. Complexion effects. Useful hints.

In general, the methods of employing static electricity are in marked contrast to the applications of other currents. Instead of placing certain tissues, or portions of the patient's body, between two electrodes, and affecting chiefly or only the included parts by employing a current with a direct circuit flow and little or no lateral dispersion, we transform our entire patient into one great electrode by seating him upon the insulated terminus of the acting pole of the machine, producing a complete general electrification, which constitutes the basis of all static treatment. Upon this all local applications are grafted. The other pole is usually connected with the earth and disregarded in general treatment.

When the machine is started into action a separation of the collected electricity into positive and negative takes place. Each dissociated portion of the electric force, being self-repellant, strives to escape from the enclosing case of the machine by a separate channel, and the result is a continuous flow from the higher to the lower potential. The flow from one half of the revolving glass plates is carried off to the earth by the

chain attached for this purpose to the unused conductor, while that from the opposite half of the plates is conveyed by a conducting rod or chain to the insulated platform, where its downward flow is headed off and a remarkable phenomenon takes place. Unable to pass down the glass supports of the platform to reach the great negative magnet the earth, the swift output of the machine *accumulates* like a fast-rising flood, escaping upward and outward at every point where the tension of insulation gives way. The accumulation from a powerful machine is thus sufficient to form a great electric pool upon the platform, in which the patient is invisibly bathed, becoming electrified with the same potential as the prime conductor to which he is attached; and he is charged everywhere alike throughout every tissue, filament, and fibre of his body, for it is a law in electrics that "the potential inside a conductor has the same value as at any point on its surface."

There is no clothing to remove, no current direction (ascending or descending) to take into account, and no rheostat is required to govern the current strength of general electrization.

The individual upon the platform is simply permeated from foot to head, not with a galvanic streak shot through him from point to point, but by an electric force of illimitable dispersive power, and a penetrating energy that laughs at the resistance of the human tissues.

Without *accumulation* there could be no therapeutic employment of static electricity, owing to the small quantity of the current stream. To illustrate this, we may stand the patient upon the floor instead of the insulated stool, and place the hand upon the conductor as before.

The current now flows through the body to the earth at its normal rate of strength (quantity), but no crackling sound is heard as it escapes, no hair stands erect upon the head, and the spark from the largest ball electrode is so small and feeble that, to obtain it, the electrode must be held within about half an inch of contact. Various tests of this kind may be made by

each operator for himself, and by personal experimentation alone can the physician become intelligently familiar with every phase of action of the static machine.

In placing the patient on the platform it is necessary to see that the dress does not drag on the floor at any point to leak off the current.

For practical treatment any ordinary wooden chair with or without a back may be employed. A simple cane-seated stool is necessary for general purposes. The chair may be any form, rocker, reclining, or upright, and may be seated with cane or leather, but must be devoid of all metallic ornamentation, such as fancy-headed nails around the edge. An ordinary steamer chair is also exceedingly useful when one is treating a feeble patient who finds an erect position tiresome.

To obtain effects which are both pleasant and beneficial, a certain degree of care and experience is required, for, unless properly administered and with due regard to circumstances, static electricity is liable to prove disappointing. It may even be made exceedingly disagreeable; nay, it may be intolerable in the hands of a careless bungler. A great part of the expressions of appreciation, pleasure, and satisfaction elicited from patients is due to the judicious use of the various electrodes. On this account I shall describe more fully certain features of practical importance.

General Electrification.—This has variously been termed insulation, the static bath, etc. But the term I here adopt seems more appropriate. It is a mild but efficient tonic, having somewhat the twofold action common to all forms of electricity, according to the energy of the dosage employed and duration of treatment.

When applied with the positive pole, it is a refreshing, grateful, and most agreeable tonic in all debilitated or negative states of the system—those neurasthenic, anæmic, malarious, cachectic conditions in which the patient is "below par." For the after-effects of the "grippe," for brain fag in professional

men, for physical, mental, or nervous exhaustion it is in the nature of a specific. The mildness of the treatment by the positive static charge, its facility of administration, its well-nigh universal applicability to every age and to every possible condition of disease, attach to it a peculiar importance which is worthy of our fullest consideration. It is in fact an artificial positive electrification of the atmosphere.

No one can doubt that the natural electrical conditions of the air we breathe influence health. Scientists assert that all atmospheric states which have been observed to have an unfavorable influence upon health are accompanied by an increase of negative electricity in the air. It is well known that before a thunder-storm an indescribable sense of malaise and oppression is felt by many individuals, and especially by those of a delicate nervous temperament or subject to rheumatism, neuralgia, etc. At such a time the atmosphere in the neighborhood of the earth is surcharged negatively, and the common expression that a thunder-storm clears the air is scientifically correct; the equilibrium of the two forces of electricity being restored by the exchange in the visible form of lightning between the lower negative and the upper positive layers of air.

The state of the electrification of human beings in normal health is almost invariably found to be positive. Many of the good results derived from static electricity during its flourishing period in the eighteenth century, when it seemed to perform almost miraculous cures, probably were due as much to the positive electrification as to the now obsolete "shocks," which were then deemed necessary, since Ramsden's machine, which was introduced in 1760, and for long afterward was in common use, would administer only a positive charge when applied in the ordinary way. The positive charge is therefore of primary significance in general debilitated conditions from infancy to old age, whether the results of exhausting illness or drain upon the system, or overwork, anxiety, excessive lactation, suppuration, impaired nutrition, social dissipation, functional derange-

ments, or mental states such as hysteria, melancholia, hypochondriasis, nervous insomnia, etc. In regard to its influence upon malaria Dr. Maddock observes:

In my experience I know of no more valuable feature of static electricity than its power to help eliminate malarious conditions from the system. It has been universally admitted by scientists that in malarial districts the air is electrified negatively. Following out this thought, I reasoned that owing to the greater conductivity of the air, due to moisture, people residing in paludal districts were deprived of an adequate supply of positive electricity. Acting upon this, I have for years employed the static machine by positive insulation in every case of suspected malarial origin, and the results have surprised myself. At times, before I obtained my present machine, I was, owing to atmospheric influences rendering the generation of electricity in any sufficient quantity impossible, tempted to abandon this form of treatment, but in over a year and a half I have never been disappointed in getting quantity and quality to meet all demands.

When a person is simply "run down," "overworked," and "completely fagged out," but unable to leave business and seek a change of climate, our daily experience confirms the belief that the alterative and stimulating effect of electrification embodies the potential benefit of a climatic change, sea voyage, and rest; and it may be remarked that the atmosphere surrounding a patient seated upon the insulating platform of a static machine is richly charged with ozone, which the electrical action rapidly generates, and which, inhaled by the patient during treatment, no doubt contributes to the beneficial results.

Negative electrification is applied in the same manner, but from the negative pole. It is tonic in lesser degree.

The principle of "localized electrization," established by Duchenne, who sought to cure disease by local treatment, has had an overshadowing influence upon electro-therapeutics since his day; but while recognizing the value of the local method, and utilizing to the fullest extent the advantages of its specific application, the static method goes farther, and has for its basic principles a general constitutional influence, upon which the local effect is simply grafted.

The entire administration of static electricity is first, last, and all the time a general systemic impression upon the entire organism, the vital functions, and excretions; furnishing during every form of treatment an elementary and continuous impression upon the nutrition of the individual, which seeks to promote the highest degree of constitutional vitality and to increase the tissue resistance against disease germs and unhealthy surroundings. This grand foundation benefit is inseparable from the therapeutics of static electricity, and therefore underlies the application of every form of local treatment, and may be considered as adding to the importance of all local treatments which are administered to the patient.

The Therapeutic Choice of Poles.—Almost every physician just commencing his experience with the static machine is greatly puzzled about the choice of poles. The difference is one of comparative voltage only. The fine discriminations some attempt to make in reporting their clinical results simply result from lack of information on the subject. One pole can be made to do just about all that the other can do if the operator is sufficiently expert; but differences in sensory effects are most manifest in local applications when the higher-potential current encounters resistances or attractions. This leads those who do not comprehend the state of the case to say that it is more "stimulating."

The discussion of polarity was practically settled one hundred and twenty years ago, but when it revived again in recent times it assumed about the following theoretical aspect:

"That we are every day bathed in an atmospheric electric bath is scientifically established. Prof. Elihu Thompson demonstrates that as we rise from the earth's surface to different altitudes, there appears to be a gradual increase of potential with respect to the ground, so that at one thousand feet there may be ten thousand volts difference between the air at the top and at the surface; and this difference may increase as we reach higher altitudes.

"In low, damp, malarial regions it is found that the atmosphere is electrified negatively, while the higher we go the more positive does the atmosphere become. Dry, clear, cool, sunny, rarefied, high (positive) altitudes are recognized as a stimulating combination of climatic attributes, which we would select for a large class of invalids, including those of phthisical tendencies, and as a tonic and restorative for persons suffering from overwork in business or professional pursuits, and who have no real organic disease. Accordingly, we should select also for these patients the positive pole for general static treat ment, save when exceptional indications suggest otherwise.

"On the contrary, a humid, equable, warm, cloudy sea-level, and sedative climate, or again the calm, sedative, yet tonic atmosphere of the pine woods, would be selected for other cases, and especially in certain hyperexcitable states of the nervous system. Here we might administer negative electrification.

"There is another not unimportant thought in connection with this idea, which relates not so much to the character of a climate as to the influence and effect of a *change* of climate; and, to a certain extent, this can be effected by static (positive or negative) electrification. Though we can scarcely affirm that a change of climate is a specific remedy for any disease, yet the benefit which it frequently produces, in assisting the reparative powers of nature, is a matter of world-wide observation. Change of climate, however, is an exceedingly relative phrase, and need not necessarily involve an expensive and difficult journey, with the deprivation of accustomed comforts and a residence among entire strangers. Dr. E. I. Sparks well says 'that a few-mile journey from the town to the country, from inland to the seashore, from the plain to the mountain, often suffices to produce marked results.'

"But while it is impossible for every one to travel in search of health, we have a means in the static machine of providing something of that element of contrast in the daily electrical and

atmospheric environment of the individual which is the great incentive to a journey."

These remarks about static polarity are entirely theoretical and have been made before. In practice I ignore theory and am guided by experience and necessity. The two poles represent chiefly a higher and a lower voltage of the same current action rather than opposite currents.

The chemical difference of galvanic polar action does not of course exist in the case of static electricity, and as a matter of fact I consider it settled that the result to the patient in increase of weight, regulation of temperature and heart action, composure of the nervous system, increase of urea and diminution of uric acid, and other general nutritional benefits, does not vary a great deal in the use of either pole.

I insulate the patient positively, as a general rule, in all cases of simple electrification for sedative-tonic effects, unless I am treating for the first time a new and timid patient whose wearing apparel might be "irritating," and whom I wish to introduce to the machine in such a manner as to avoid the most remote possibility of alarm.

I insulate all patients negatively for the purpose of giving a mild positive spark. If I am dealing with sluggish, insensitive, and thickened tissues, requiring the most vigorous and stimulating spark that can be applied, without the regard to comfort which sensitive tissues would require, I change the electrification to the high potential. I insulate all patients negatively for an ordinary mild positive breeze effect, and also change to positive electrification and negative breeze when a counter-irritant effect is desired.

With smaller apparatus, however, and non-metallic connection between patient and machine the results which I thus secure cannot be duplicated with negative electrification, because the current is not powerful enough. The operator, however, can substitute positive electrification when it is necessary.

The static breeze reverses the order of the preceding. The

positive breeze is bland, sedative, and agreeable, while the negative breeze may be made irritant. The fact that negative low-potential electrification is employed in administering the positive breeze accounts entirely for its softer and soothing qualities.

Both forms of breeze are analgesic and will relieve many varieties of pain. The positive is peculiarly grateful and effective in neuralgias, in local inflammatory lesions, in congestive and nervous headaches, nervous insomnia, and irritability. It will rapidly remove almost any nerve or muscle pain not due to structural change, and I have found it equally efficacious for a toothache and an aching bunion.

The grounded electrode with positive electrification yields a remarkably useful breeze, and one which will answer for many purposes. The breeze (a convective discharge) will not produce a muscular contraction, while the spark (a disruptive discharge) will; hence nothing can take the place of some form of spark in affecting muscle function, promoting absorption, etc., but I have occasionally removed very severe sciatic pains with the breeze alone, and if applied in its irritant form, like a hot spray, it is effective in muscular rheumatism and conditions requiring a powerful rubefacient and counter-irritant. Thus it is a superb cutaneous stimulant, will rapidly draw out rheumatic pains, ease a lame back, warm cold extremities, quiet a grumbling ovary, relieve the pains of a congested liver, remove nausea from a dyspeptic stomach. It imparts a long-lasting buoyant glow to the spine, is a most exhilarating tonic, reddens the skin, and leaves a sensation of lightness and warmth behind.

Either the negative or positive breeze, upon a bare surface, is cool, comforting to heated states, has no rubefacient or irritating effects, and is particularly tranquillizing upon the head and spine when no resistance interposes.

The most soothing application is the positive breeze. With this the electrode may be held quite near any part of the body. It easily gives off a spark and may startle the patient unex-

pectedly. It does not tend to irritate, but it involves a negative insulation.

The positive breeze may be applied to the head, spine, or any part of the body with very little fear of irritating the patient. Not so the negative breeze with positive insulation, attaching the electrode either to the negative pole or to the gas fixture. Upon covered surfaces it is prickling (and through some fabrics unpleasant) if the electrode is held motionless. To be agreeable it requires to be kept moving. A negative head breeze can be given with the standard if the patient is bald, but if hair abounds upon the head, or if applied to any clothed surface, the electrode must not only be removed to a distance—twelve to twenty inches or more—but the breeze should be kept in gentle motion to avoid an annoying prickling in certain spots. Effects depend on regulation of the dose.

The thickness and quantity of the hair may make it difficult to give this form of breeze from a stationary electrode, although the patient may sway the head from side to side to suit his or her sensations. Upon the head also, a lady's hairpins, if metallic, may play havoc with our efforts to please, and it is the writer's custom to substitute vulcanite hairpins before commencing treatment. Occasionally metallic ornaments about the neck will cause discomfort, and should be protected, removed, or avoided by the operator. About the spine and abdomen steel buckles, buttons, and corset ribs may be an interference with both breeze and sparks. In a general way it is also better to have a patient lay aside keys, watch, eyeglasses, etc., if local applications are to be made in their vicinity; but in most cases the tact of the operator will sufficiently avoid these sources of discomfort; and it is better, if possible, to request few changes in a patient's garments. It is rarely necessary, and the trouble of taking off her corsets for treatment will not increase the popularity of static electricity with a fashionably attired lady.

But all our care in administering the breeze is not dependent upon hidden corset steels and metal hairpins. If the coat or

dress waist be of silk or cotton fabric, the best effect is obtained with the electrode almost as near as the current strength permits without a spark, gently sweeping the electrode over the region treated and drawing it away with such manipulations as experience discovers to suit the particular case in hand. If, however, the fabric is of wool, the sensation produced may be unpleasant. If tightly woven and thick, the breeze will perhaps be scarcely felt, and must be applied correspondingly near. If the woollen garment be of loose texture, it may be difficult to find any distance at which the electrode may be held to make the negative breeze agreeable to the patient. Certain desired effects may, however, be had by rapidly sweeping the electrode to and fro, and the prickling may be modified in various ways, such as covering the part with a handkerchief or towel, diminishing the speed of the machine, or by leaking off part of the current supply.

An exceedingly mild and exquisite breeze may be obtained, when exceptional conditions call for the utmost refinement in our measures, by simply holding a finely pointed electrode in the hand without grounding it in any other way. It should be grasped by the operator upon the metallic part without opposing any of the insulating rubber handle, and, when moved with gentle passes near the patient's head or spine, the breeze imparted is of the mildest nature.

Many times the reverse is desired, and we wish to increase the intensity of the breeze. This may be done by quickening the machine, by having the patient in direct connection with the positive pole, by placing a layer of flannel cloth over the part, if it is covered with a less resisting substance; but most of all, the activity and force of the breeze may be increased, while its irritation is often diminished, by interrupting the current by the author's method, as elsewhere described.

On the whole the breeze application is susceptible of great variety, and if skilfully handled, with due tact and prudence, it will do more than any other form of electrical application to es-

tablish a large and gratified clientèle. If the physician who wishes to excel in technique will seat himself upon the platform and personally test the sensations which the spray electrode will produce under the different conditions we have referred to, it will be time well spent and money saved; for a disagreeable shower of "pins and needles" may lose a new and nervous patient as readily as a luckless spark.

The static spark requires to be somewhat sparingly and prudently administered. Its redeeming feature is its tremendous power for good. If the suggestions here made are followed, it will be disarmed of its drawbacks and will be a most potent influence in contributing to the great sum of results attributable to static electricity. All cases do not require sparks, and when sparks are especially indicated, mild ones may often serve the purpose.

To apply sparks, we have the patient insulated as before and continuing to be electrified; either positively or negatively, as the case may be. Ordinarily we have the negative pole attached to the platform, and apply positive sparks.

The spark is given with a spherical electrode usually, although any metallic electrode will give off some kind of a spark, if it is placed in a position to do so. The round extremity of the electrode may be of various sizes, and the thickness of the spark will be partly dependent upon the surface area of the ball. We take the largest one—say two inches and a half in diameter—attach it to the grounding gas fixture by the chain we have already used in employing the breeze electrode, and explain to our patient what is coming. Never apply a spark without first telling the patient to expect it. It is rarely advisable to administer sparks at a first sitting if the patient is a stranger. After several treatments the system acquires a degree of tolerance, especially after confidence has been established by the tact and skill of the operator.

If the patient is an acquaintance, a brief explanation may suffice to prepare him or her for any form of application that

may be desired, but it is my custom to show all nervous patients who have never had sparks exactly what they are, tell them how they feel, and obtain their confidence before administering this treatment. I then slow down the machine, if necessary, leak off part of the current force with my foot against the platform, and deliver a single mild spark upon a part where it will be well borne, usually the fleshy part of the middle thigh or upon the spine. This done, the patient's uncertainty and dread are ended. She has felt just what the spark is, and seldom offers any further objection.

Not always is the spark found to be disagreeable. A surprising number of patients will claim to really enjoy mild and skilfully directed sparks. Cases will be met in practice in which, indeed, the spark is the most welcome form of treatment. The torpid tissues of an œdematous limb may be so insensible to stimulation that the heaviest sparks that can be obtained from an ordinary machine are calmly witnessed by the patient, who regards the blows with manifest indifference; and in morbid states of sluggish natures and lymphatic temperament, the sparks will seldom cause any objection.

If the long spark is discovered to be painful and distressing, it is well to be very sure that it is indicated before giving it. It is generally found to be most bearable, most welcome, and most beneficial where it is most truly indicated; and, on the contrary, it is least tolerable when least required, though there are exceptions to this rule. A toleration also is often speedily developed.

Once across the Rubicon with a new patient, the strength and vigor of sparks, which have always at first been mild, may be adjusted to fit the case; but let the accession of vigor be imparted gradually. Sparks should be no heavier than needed to do the work. They should first be tested in a mild form before resorting to the most powerful that can be given. They should be clean, thick, distinct, and single, with both an interval of time and a "change of base" between every one

administered. A rapid fusillade of sparks is often unpleasant. A number upon the same spot is apt to create a tenderness. A long, thin spark is usually stinging, while a thick one is less so. If the spark "splits" and gives off fragments, seek the cause and correct it, for such a spark produces an uncomfortable sensation.

About the throat and various parts of the body it is often desirable to accurately localize the spark, while attracting promontories near by render this difficult to accomplish. A spark director is made for such a purpose, but it is expensive. An insulated piece of vulcanite, or even of wood, pierced in the centre for the passage of the spark, is also occasionally employed. These devices, however, are seldom an absolute necessity. There is scarcely a spot upon the exterior of the body where a spark may not be exactly placed by drawing aside the adjacent parts, slowing the machine, and sending the ordinary electrode to the spot with a quick, sharp stroke. A nearby prominent part may be protected also by laying over it a folded paper, or something to obstruct and lessen its attraction.

Having a case for powerful sparks in hand, we may now increase the effect in several ways. Putting the machine into more rapid action is usually sufficient in favorable seasons. If more than this is required, we may again make direct metallic connection between the patient and the machine. The conducting rod or chain may be held in both hands or placed under both feet. Caution will be advisable if this is done, for the first result may surpass our expectations. If this proves less powerful than is desired, however, as may be the case in damp and summer weather, a pair of small Leyden jars may be brought into the circuit. Still greater caution should now be displayed, and the spark tested before applying to the patient. The smallest jars may be tolerated usually, but the larger jars overdo the matter, and the largest size should never be employed unless for good and well-understood reasons, and by an experienced physician, between whom and the patient there is entire confidence.

Sparks may be administered, as may also the breeze, while the patient is electrified with either the positive or negative pole; and with the electrode attached to either pole, or to the ground.

When we desire a muscular contraction, without the sting which is more or less inseparable from a spark directly upon the patient, the author's method of interrupting the current is of use. The part is bared sufficiently to apply an electrode directly upon the skin, and, in turn, over the motor points of the faulty muscles. The electrode is attached by a chain to one pole of the machine. The other pole is grounded, and with a grounded ball electrode sparks are slowly applied to the pole to which the patient is connected.

Another way—and one equally available—consists in holding a small ball electrode upon the spinal motor points while the machine is adjusted as in ordinary positive electrification. With a grounded ball electrode, sparks are then applied to the metal part of the electrode held in contact with the patient, but at a distance from the ball, which presses upon the motor point of the muscles.

The contraction which follows is painless and effective. In this way an unlimited number of sparks may be applied to any given point without creating tenderness, as do repeated sparks upon a single place upon the body. Moreover, the strength and frequency can thus be so regulated as to produce effects reaching from slow, single, deep contractions to the infinitely rapid, sedative quality of the high-tension faradic coil.

Air spaces under folds in the apparel interfere with sparks and should be removed by drawing the garment to a smooth fit. Damp clothing will interfere also, and some fabrics facilitate the application more than others. A steel buckle, a bunch of keys, metal buttons, ribs and steel springs in waists and corsets will attract the spark and produce too sharp a sensation for comfort in some cases.

In all static administrations there must be two objects kept

in view. One is to produce benefit to the patient; the other is to avoid all possible annoyance. It is always desirable to strive to make the treatment as agreeable as possible, and this is generally as important a factor as the constitutional effect of the treatment, for the two results will proceed better in double harness than if the patient thinks the cure as bad as the disease.

Considered as a mere luxury and apart from remedial effects, no other form of medical treatment is capable of imparting the sense of satisfaction which can be obtained from certain forms of static electricity. Unless the effect of a counter-irritant is especially desired, the breeze should be as agreeable around the head and spine as the soothing manipulations of a dexterous hair-dresser. If sparks are applied with conservative caution until tolerance develops in the tissues, there will be very little complaint. Slowly repeated, clean-cut sparks will be readily endured even by hypersensitive neurasthenic cases. Never treat a new patient to a fusillade of sparks at a first sitting.

There are certain anatomical localities which are usually to be avoided. In a general way the head should be omitted from spark treatment, though to this rule, as well as to most others, there are exceptions, and modified sparks are frequently applied to special portions of the head with great benefit.

The breast, both in male and female, and particularly the nipple, is sensitive; in many cases extremely so, and should not be struck with a spark except for sufficient cause. Bony prominences throughout the body are regions where caution is advisable, there being no pillow of soft tissue to break the blow. A spark on the dorsal surface of the foot or hand, and especially over a toe or finger-nail, is more uncomfortable than many patients would admire unless the conditions are altered by disease, as they would be in a case of chronic synovitis, or localized œdema.

The testicles, most of all, must be avoided. The sickening sensation caused by a spark in this peculiarly sensitive region would have no other excuse than bungling carelessness.

Besides the ordinary and single, thick percussion spark, which has hitherto been the subject of our consideration, there is a form of "friction" spark which has certain uses. It may be obtained in several ways. The ball electrode may be enveloped in a flannel covering and rapidly rubbed over the surface, if applied directly to the skin. Upon the covered body the same effect is furnished by the resistance of the garments worn, especially if of wool. It is quickly applied, and exceedingly valuable in myalgias and as a cutaneous stimulant.

One of the most effective methods, also, and one often employed by the author, is secured by rapidly interrupting the current and using the spray electrode. The *technique* is as follows: Let the patient hold the conducting rod above or below the sliding positive pole of the machine so as to draw a series of rapid sparks of a length to suit the conditions of the case. The point electrode is then grounded or connected with the opposite pole, and rapidly swept over the affected part at the distance which is found to produce the proper effect. As the electrode approaches nearer the spine or limb to which it is applied, the breeze will merge into a brush discharge, and still nearer this will become filled with jets of fine, flying electrified particles of air—a veritable electric spray! Stronger sparks will occasionally be interspersed with the finer jets, if the electrode is swept still nearer, and the administration partakes of the nature of a powerful and stimulating tonic. Its intensity is, however, under complete control, and may be regulated to a proper degree. Friction sparks are heating and counter-irritant as usually applied.

The static spark is the most energetic of the various forms of electrical discharge, and is also the most powerful therapeutic application of static electricity. It excites strong muscular contractions and produces a widespread mechanical disturbance in the tissues to which it is applied, causing active molecular change and exerting an extensive influence upon both local and general nutrition. The short, fine friction sparks obtained by

simply rubbing the ball electrode over the surface of the patient in contact with the ordinary garments worn are indicated chiefly in cases of altered peripheral sensations, anæsthesias, myalgias, etc., but this stimulation of the terminal nerve filaments is carried to the central cells and produces deep and lasting effects. Frictions can thus produce rapidly, in a few moments of application to the entire body and without removing any clothes, an effect of counter-irritation and reflex stimulation.

It is, however, the long and strong, thick spark which is the most effective weapon in skilful hands. Its range of action is wide, and if carefully employed in varying degrees of strength, its power for good may be called into requisition in the majority of cases demanding static treatment.

It is this spark which restores tonicity to enfeebled or paralyzed muscles, softens indurations, resolves exudations, breaks down adhesions, and promotes absorption; stimulates nutrition and the functions of the central nerve cells; drives out hysteria, banishes rheumatism, gout, and malaria from the system; conquers sciatica and neuralgias of almost every form, relaxes contractured muscles and tendons, and subdues some of the most furious pains. It is the great alterative and regulator of nerve and muscle functions and functions of the visceral organs.

It is the tonic *par excellence*, deep-acting and far-reaching in its effects. It requires, however, to be employed with discretion and with a reasonable degree of tact and skill.

Potential alternation is the author's method of interrupting the ordinary static current. A description of this method was first published in the *Medical Times and Register*, September 9th, 1893, under the title of "A New Static Interrupted Current; a New System of Therapeutic Administration of Static Electricity Based upon the Principle of Potential Alternation."

From this article the following extracts are quoted:

I have for some time employed with satisfaction to my patients and myself a new method of applying static electricity, of which I have seen no account hitherto published.

In the method which I shall now describe no change is made in the adjustment of the machine or in the patient's clothing. The patient is seated upon the platform, and after being charged in the usual manner, his potential is suddenly reduced to zero by the approximation of an interrupter to the conducting rod. A succession of alternations between a high and zero potential may now be maintained as rapidly or slowly as desired.

The interruptions may be regulated at will from one in any number of seconds to any number per second, and by fixing the interrupter on a standard the application becomes automatic and does not require the operator's constant attention.

Whatever of therapeutic value is imparted to galvanic and faradic currents by "interruption" must also be imparted to the static current; and the speed of the interruption of the static current can, by my method, be made to cover a greater range than any faradic vibrator yet invented. When administered merely for its general nutritional effect, it is exceedingly suggestive to note the visible oscillations of the patient's hair, to feel the vibratory commotion in the surrounding atmosphere, and to consider the molecular disturbance and alteration of nutrition which must be going on in every part of the electrified body.

And this alterative commotion among the tissue cells, quickening the protoplasmic activity, is carried on so mildly that the patient is conscious only of the gentle vibratory breeze. As regards local applications to give muscles work and stimulate contractions, I have found this method of practical service.

It is evident from a mere glance at the extremely limited variety of static applications and the limitations of each, that a new method of practical simplicity and extensive therapeutic range is a desirable contribution to static treatment. It can be applied to the whole or any part of the body without change in either machine or patient, and employs the electrodes in common use. A careful review of such records as have been available does not disclose any reference to any similar system of applying static electricity.

While a number of ingenious devices might be contrived to be employed in the use of this method, it will usually be sufficient to utilize the ball, point, and roller electrodes. These, with the rod, a chain, a foot-plate, and a standard, will enable the operator to obtain about all the effects he may desire. The ball electrode is used as an interrupter, drawing sparks from the prime conductor instead of from the patient. If the roller is attached by a chain to the machine, it may be applied by the operator to

any or all muscles in turn, and rapid or slow, mild or very powerful, but painless contractions may be set up. If the patient's feet are placed on a metal plate or in a foot-bath and metallic contact is made with the machine, a negative breeze electrode placed at a proper distance above the head, while the ball electrode, grounded and fixed on the standard, is adjusted so as to draw a succession of long sparks from the positive prime conductor, a tonic and alterative effect upon circulation and nutrition will be obtained that is exceedingly beneficial in cases of disturbed equilibrium of the vital functions.

As a means of giving exercise to the arms, there is no other method superior to potential alternation. Simply wind the chain around the forearm (bare) and proceed to interrupt the current. Every muscle will be brought into play, more or less, according to situation of the contact. If held in the hand, or if the hand is immersed in a bath, an effect extending up the entire arm may be produced.

I have noted in cases exercised in this manner that the muscles not only become firm and play under the skin with remarkable facility, but that the skin itself becomes tanned as if from exposure to outdoor sun and air. I have never seen this effect produced by direct sparks upon the person, but have witnessed it repeatedly in cases treated by potential alternation. The pallor of persons confined to the house by protracted illness is thus removed very rapidly and replaced by a healthy color, even though they continue to remain indoors.

Much more could be written upon this subject, but no treatise, however complete, can take the place of experience. In order to operate a static machine with satisfaction and with good results, it is necessary that the physician should not only acquire facility in the technique of handling the machine, but he must also know how to inspire confidence in the patient, and at all times exercise the care and minute attention to the details of his treatment that are essential to success in all forms of electrotherapy.

In static applications there are but two chief forms of the kinetic energy to consider. One is the direct flow along the prime conductors; the other is the flow through Leyden-jar condensers. It will be noted that my system involves all methods of interrupting the direct static current. In my method the manner of the potential alternation is immaterial as relates to the principle of action, and is important only as it modifies the effect. For instance, the interruption may be made with the sliding poles the same as is now done in the case of Leyden-jar currents; but I do not recommend this manner, for the reason that the control of the rate of interruption as well as of the dose is far less satisfactory than when the electrode is used, as I have described. Moreover, as demonstrations of the high potential energy of either interrupted static current, a perceptible effect may be obtained from the application of a single electrode whether the second pole is grounded or included in the circuit or not; but to obtain full therapeutic usefulness it will be well to adhere closely to the methods recognized as most effective in actual practice.

In carelessly or ignorantly employing galvanic or even in some degree faradic currents, there is a well-known possibility of doing harm. This liability is reduced to a minimum in the case of static applications; nevertheless, a patient may be startled by careless sparks or any accidental derangement of the administration. In avoiding needless causes of alarm to the patient the physician will do much to build up his success with static electricity.

Useful Hints.—Having had frequent occasion to observe the difficulties which beset the novice in acquiring familiarity with static technique, the author ventures, even at the risk of being considered elementary, to insert at this point a few practical reminders. Physicians who do not need these suggestions may pass them by, but to not a few readers they will possess a timely interest and real value. Of course no experienced operator requires any instruction of this kind,

but others of less experience or none at all will probably be glad to receive any aid to the satisfactory use of the static machine.

Don't neglect proper care of the machine.

Don't expose it to damp draughts.

Don't operate it in too small a room.

Don't place the platform and patient too near the machine or gas fixture.

Don't place objects of furniture so near that they will attract the current from your patient.

Don't stand so near the patient yourself that you will do the same.

Don't allow an electrified patient to touch objects or shake hands with a visitor.

Don't pass so near your electrified patient while directing treatment that you will draw an unexpected spark and startle your patient unnecessarily.

Don't incautiously handle a charged Leyden jar.

Don't seat a patient for treatment on a chair that contains ornamental brass-headed nails in its upholstery.

Don't fail to remember corset steels, wire hairpins, lace pins, buckles, metallic trimming, etc., in directing local applications to neurasthenics.

Don't forget that thickness, dryness, and quantity of a patient's hair will affect the intensity of all applications about the head.

Don't forget that fit, material, texture, and thickness of garments directly influence some forms of static applications, which must be modified accordingly.

Don't forget that static sparks are not always popular, and remember that you have a patient to treat as well as a pathological condition.

Don't forget to ground the electrode.

Don't start the induced current into action with the sliding poles drawn wide apart.

Don't fail to see that the machine is charged and in working order before you call your patient for treatment.

Don't forget to ground the indifferent pole.

From time to time a physician to whom I am giving clinical instruction in the uses of static electricity will refer to some minor variation of method he has perhaps read about elsewhere and ask me why I do not do the same thing. I never argue about such a question but demonstrate both methods and let him take his choice. Static electricity will not perform equally well in all cases when routine methods of any kind are employed in an unvarying way. I am not wedded to any hobbies and at all times approve of the best means which will produce the best results.

NOTE.—In this chapter small justice is done the static spray. Pages 77 to 80 fail to bring out the important therapeutic actions dependent on spray technique. Pages 77 to 80 may also mislead physicians into regarding the breeze and spray as perfunctory routines. The real facts go far beyond the faintly developed hints of dosage given in this chapter. My clinical instruction in spray technique and uses has always astonished my students, and on now reading over this long-forgotten chapter I understand why. To supplement properly these earlier statements, the reader should refer to Chapter V. in my recent book, "Elements of Correct Technique," which is a condensed supplement to my large text-books, and which treats of static, galvanic, faradic, and sinusoidal technique in the most up-to-date manner.—THE AUTHOR, 1901.

AUTHOR'S NOTES.—The chief fault of this chapter is its neglect to teach *dose-regulation* and the therapeutic principles underlying the applications of the methods described. But when the original text was written early in 1897, and until a recent date we were reserving for our clinical demonstrations the more difficult part of the subject of static electricity. It is not easy to put into print some of the things that can be shown in a few minutes. In minor respects some of the details of this chapter could be modified, and an expert would ignore some of the others, but for a beginner using a moderate current from the average machine the chapter is sufficiently reliable and instructive. It is probably more complete and workable than any other book furnished at the present time outside of

our own later writings. When we get time to take up the long-deferred task of writing a really complete treatise on static electricity with the rich experiences of recent years to describe, this primitive text can be laid away for the good it has done.

It will be noted that we confine ourselves here to the simpler methods of technique, and properly so, for this work was intended to aid beginners. To confuse them with difficult technique, or to write into each treatment all the variations that an expert could utilize would hinder and not help them. This is especially true of the local and general applications of the interrupted direct static current originated by me and briefly referred to on pages 86–9. Since 1899 it has been greatly praised by others, and by some valued more highly than the Leyden-jar interrupted currents. We have used it in all the possible applications since 1893, and have written the "System" up more fully in one of our later books. When we next take up the subject it will be handled completely. The main difference between working with a heavy and rapidly efficient current from a large static machine of thirty-two or more plates, and working with the small machines in vogue ten years ago, is shown in this chapter. At present we would ignore many of the details then necessary to secure results, and with the efficient dosage gain our effects with less trouble and in half the time.

Those who take interest in so-called "wave currents" will find by investigation that they are *all included* in my "**New Static Interrupted Current: A New System of Therapeutic Administration of Static Electricity,**" originated by me in 1893. Note the comprehensive nature of the title of my original article. It covers not only the Interrupted Charge but *all possible local methods*, a fact that some writers overlook. Read pages 223–4 of my Elements of Correct Technique, and also read my full article of Sept. 9th, 1893.

Clinical Instruction in working methods of Static, Galvanic, and Faradic Currents to supplement the teachings of this book will be found in the small additional book by Dr. Monell, called "Elements of Correct Technique in Electro-Therapeutics." It was written three years later than his Manual of Static Electricity and contains entirely new matter. It is a series of actual clinics in book form. 320 pages, octavo.

E. R. PELTON
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CHAPTER VI.

HOW TO REGULATE THE STRENGTH OF A STATIC APPLICATION.

Position of rod upon the platform. How to increase current strength to any desired degree. Direct metallic conduction important. How to intensify local applications of breeze, spray, and spark. Dose regulations of Leyden-jar current.

THE dosage of static currents in general electrification with either pole is affected by the following:

1. Rate of revolution of plates from very slow to very fast, the activity of current output being in proportion to their speed.

2. Good or bad conduction of the current from the machine to the patient, and the insulating capacity of the platform.

3. Attraction of the current away from the patient during electrification.

4. Reinforcement of direct current by Leyden-jar condensers.

5. General atmospheric and physical conditions of the machine and the office.

6. Operative skill of the physician.

The means at our command to modify, increase, or decrease the strength of treatment, and regulate its force to suit the varying requirements of disease, are complete and adequate in the case of static electricity without employing either a meter or a rheostat, such as are necessary with galvanic currents. No such instruments are made for use with the platform applications of static electricity and we would not need them if they were.

With the patient in position for treatment the poorest method of connecting the pole of the machine with the patient consists

in resting the lower extremity of the brass rod upon the corner of the platform surface most distant from the person's feet.

A great deal of resistance must be overcome before the current reaches the patient, and the great difference of potential between the prime conductor and the patient, when both should be alike, is detected by requesting him to touch the rod with the hand and note that a spark will pass. It is obvious that by this manner of placing the rod the patient will receive a very weak current and only a small part of the actual output of the machine.

The weakest output of the machine is obtained by the slowest revolution of the plates. Stronger electrification will be secured by pushing the end of the rod nearer the patient's feet and making the plates turn faster. No wooden platform surface is, however, a very good conductor. In damp, sultry July and August weather the atmospheric leakage of the current may be more rapid than the conduction over the platform to the patient. The insulating resistance of the air is diminished by the dampness, and a good spark is then difficult to obtain. If increasing the machine activity does not sufficiently increase the patient's electrification, we must better the means of getting the current into him. The best that can be accomplished in this direction will be done by cutting out all bad conducting material between the prime conductor and patient and substituting metal.

Have the patient hold the brass rod in the hands, if this does not interfere with any desired local application, otherwise put a metal tray under the patient's feet and let the rod rest upon the platform as usual, but connect it with the foot-plate by a brass chain. At all times of the year this method of metallic contact will produce the most vigorous electrification with a given rate of the machine. In winter time it will enable the operator to obtain a maximum current without a maximum speed. In the summer time it is a necessity anyway.

If still further means of increasing the current strength are

required on a summer day, the machine can be dried more thoroughly with freshly baked chloride of calcium, the office may be closed, and a grate fire or a few gas jets be kept burning for a short time to dry the atmosphere, and the small or even the largest Leyden jars may be attached to the prime conductors and their outer coating connected.

With these precautions almost any form of desired treatment can be given during the worst season of the year. No one, however, should employ the Leyden jars until he is well trained in the use of static electricity, for a patient would be exceedingly unlikely to call again if an accident happened through the operator's want of skill, although the accident would be harmless.

To add strength to local applications of the breeze, spray, and frictional spark, we may have the patient hold the brass rod so that the upper end will not be in direct contact with the sliding pole but will rest about three-quarters of an inch away, and a spark stream of this length will intensify the velocity of the flow.

By some modification of these measures every practical increase in the vigor of any form of application may be regulated with exactness, and to weaken the administration if it is too strong these steps may be reversed.

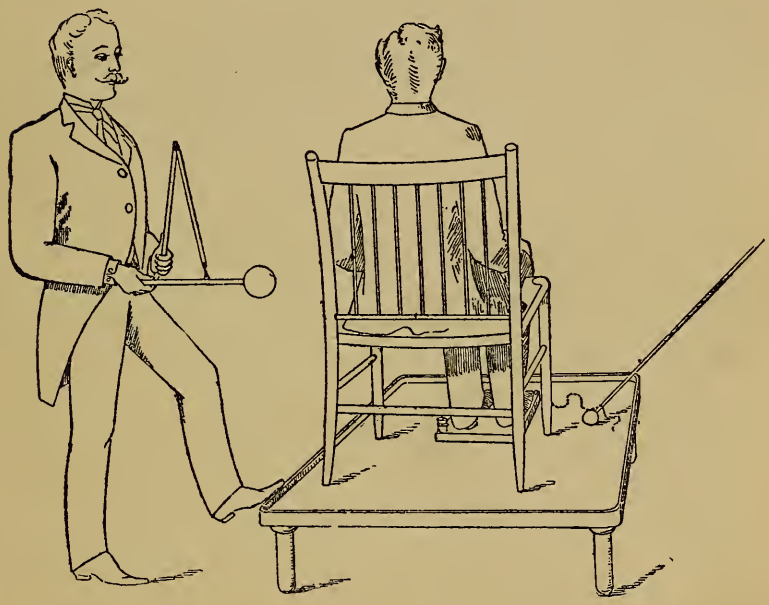
The spark can be modified in length, thickness, and strength by (1) leaking off parts of the current through the operator's foot, placed for the moment upon the edge of the platform; (2) by turning the machine more slowly; (3) by removing direct metallic conduction and placing the brass rod directly upon the wooden platform and (4) farther away from the patient's feet.

A very mild breeze or spray application may be made by simply holding the metallic part of the electrode in the hands instead of giving it metallic conduction to the earth.

A mild spark can be given in the same way, but causes a contraction in the operator's wrist.

It should be noted that in any continuous electrification or breeze application, the direct metallic connection with either

the hands or feet of the patient produces no sensation whatever. The moment the current is interrupted by any form of spark discharge the patient must be protected from annoyance by the operator. A strong spark given with positive electrification and the rod held in the hand will cause an annoying contraction at the wrist; but with both hands in contact with the



The above diagram shows the foot resting upon the edge of the platform to leak off the current when it is desired to apply a very mild spark or breeze. It is a temporary expedient which at some time is employed in the treatment of the majority of cases.

rod and negative electrification, an ordinary positive spark may be given with comfort. If shoes are thick-soled, and are filled with nails in either the sole or heel, sparks may sometimes annoy a patient whose feet rest upon the metal tray. With ordinary shoes this does not occur.

The dosage of Leyden-jar currents is regulated by the size of the jar (small, medium, or large), by the distance between the sliding poles, and by the rapidity of the revolving plates. The

nearest equivalent to a high-tension induction-coil current is obtained from the smallest jars, with the plates revolved very fast to simulate the rapid vibrator, and very slowly to simulate the slowly interrupted faradic current. Extremely rapid rates are best obtained by the use of motor power to operate the static machine. Slow rates of from fifty to one hundred and fifty interruptions per minute for muscular contractions are best obtained when the machine is controlled by hand.

The medium jars resemble somewhat the medium secondary induction coils as respects quantity of current, while the largest jars may be said to resemble the shortest coarse-wire secondary coil. The difference between these jars is a prolific source of argument between those whose electro-therapeutic information is in an embryonic state. Some say that the current from the large jars "causes painful muscular contractions," etc.; but, as a matter of fact, an intelligent regulation of the distance between the poles and the speed of the revolving plates will enable the operator to secure his desired effects with all Leyden-jar currents without any necessity of causing pain with any size of jar.

By regulating, therefore, the manner in which the patient receives the current from the static machine—whether by direct metallic conduction or through a greater or less intervening gap of air or wooden surface—by regulating the rapidity with which the plates revolve, and by graduating the management of the different electrodes to suit each case, the current can be made as gentle or vigorous as desired.

In a hot, dry room on a crisp winter day, or in a damp room on a sultry day in summer, the knowledge of how to govern the potential and current supply at will is often an inestimable advantage. It is perhaps impossible to set down in writing all the various manœuvres by which an experienced operator consults his patient's comfort during treatment, but sufficient is said above to indicate the general ways in which the beginner may proceed, and practice will teach the rest.

AUTHOR'S NOTES.—The original text of this chapter contains no errors of fact. So far as it goes it is as good now as it was in 1897. But an experience with many static machines, ranging from the small apparatus of former days to the efficient modern generator of heavy currents, leads us now to say that certain details that are important to the owner of a small machine are of no moment to us at the present time, when we command a fuller current with the simplest ease. We cannot express too strongly our increased satisfaction in static electricity as a therapeutic agent since we have enjoyed the advantages of an apparatus with 32 plates (16 revolving plates of 32 inches diameter) and combined with it our complete accessories for every variety of work.

But there are certain underlying facts to consider about static machines. Fifteen years ago empiricism prevailed. To-day we demonstrate *exact scientific methods* of treating the machine and treating patients with it, and our teachings are what *experience has taught us in our own work*. But, ignoring our rules for saving their customers trouble, we find that manufacturers, salesmen, authors and instructors long continued to tell physicians to do things that create over fifty per cent of the troubles that cause complaint, and explain another forty per cent of the reasons why five thousand men using static electricity are not easily duplicating our clinical results.

RULES FOR AUTHOR'S RESULTS WITH STATIC ELECTRICITY.

First. Get two or four deep enamelled or agate-ware pans as large as will go in the case of your machine and not set so near the plates or metal parts as to draw sparks. Chloride of calcium made by Charles Cooper & Co. is supplied by most dealers in static machines in ten-pound cans. Put the contents of four or six cans into the pans and bake out the salt over night, or get some fireman in charge of a furnace to do it for you if your office is in a large city office building. When the C. C. is white as chalk and as dry as calcined magnesia cover the pans from air, carry them to the machine, and set

the pans in the case. Screw fast the door and *keep the door shut thereafter.* Keep the C. C. in the case and the door shut. From October to May or June that job is done once for all. As the summer advances bake the C. C. out again when it turns yellow on top or becomes soft enough to scrape off with a spoon. With a tight case and not too much "open window" day and night in your office during hot weather you can get through till October again with about three or four bakings—and fifty per cent of your troubles fade into mist by this simple means. Toepler machines and Holtz machines, Eastern machines and Western machines, static machines of all types and sizes, must be treated on exactly the same principle, which is the correct principle. None other will do. Men universally assert that the Toepler machine does not need chloride, and makers teach that the Holtz machine needs it only once in a while, but those who accept the author's teachings as worth following will adopt no other plan for keeping the machine dry. Then it will not *reverse.* Then it will not lose half its value as a generator of current. Then it will charge up quickly no matter where or by whom made. It will hold its charge for months at a time without failure. It will work every day in the year, and when it works it will not do it in the feeble manner that many a beginner and even supposed expert thinks is the best a good machine can do. The false general teachings on the use of C. C. are to blame for almost all the needless troubles that afflict physicians who ignore correct principles of management. To do the work right is far less trouble than to do it wrong. There is no machine made that does not need chloride all the time, and *plenty of it* must be the rule. A little will do no good. Forty pounds for a small machine and fifty for a larger one is my rule for saving myself from troubles of discharge and reverse and to insure an abundant current always. A revolution in this matter will do more for static electricity in medical hands than would the invention of a new machine. The machines of to-day are good, but they are handled badly by all who fail to

follow the essential principles which govern the control of this type of current.

The truth of the above can be determined by test in two hours. Not long since we stated the rule to a prominent Chicago manufacturer. He demurred. "It was contrary to his life-long convictions to put chloride in a Toepler machine." But was he willing to test it? He was. A few hours after it was put in the case he saw his machine give fully thirty-three and one-third per cent more current than ever before, and saw then and for days afterwards that it held the polarity unchanged. Its tendency to reverse was stopped, and its capacity for clinical and X-ray work was increased as much as a hundred dollars additional cost would increase the apparatus without chloride. He said he was convinced, but *surprised!*

But do not let the C. C. get damp and corrode the brushes and combs too fast. With dry chalky chloride there will little vapor arise to carry up particles of the salt to the plates and metallic parts. But better renew the cheap brushes of the Toepler machine once a year and clean the rods once in two or three years and always get a rich current than to putter along with less than half the volume needed to duplicate results that all should get.

Second. Do not expect to equal results that depend on certain methods of treatment when you lack the means of employing the technique of the methods. The maker will not *give* every form of electrode with a static machine any more than he will with a galvanic battery, or a tailor give a pair of shoes with a coat; but every maker should sell accessories for a reasonable price, and every physician who has a static machine must also have a standard platform, standard electrodes of a dozen kinds, a pair of small Leyden jars, brass rods and chains, a proper electrode-handler, and the various means of treating patients that make this current a flexible and great medical remedy.

Third. Having doubled your amount of current by proper

use of C. C. and quadrupled your means of administering different varieties of treatment by suitable electrodes, simply follow the methods of treatment taught in my various books and to be far more adequately described in my next treatise on static electricity—as soon as time permits me to write it.

No dealer or manufacturer in the East or West has hitherto fitted his machine to enable his customers to practise all the important methods on which we depend for our personal results with static electricity, and consequently we find that we have been teaching skilled technique to an audience with its hands tied and unable to profit by our demonstrations of good work. From this time forth we hope to witness a different state of things, for leading makers agree to reform their equipment and permit the doctor who wants the means of exercising skill to do so. Get a list of all you need and supply your needs. Do not use a fine machine without a varied equipment of accessories to make it useful. The failure of the profession in general to procure the means of making their static machines perform the important clinical work taught in my little book on Correct Technique is fairly appalling to one who suddenly realizes that not one man in a hundred has had the means of regulating dosage with an agent with which *dosage* and *form of administration* are the main factors of success. As well walk without shoes, ride to your patients without bridle on your horse, carry pills in bottles without corks, or set your dinner table without plates or cutlery, as to restrict the use of the static machine to the narrow limits fixed by the few accessories which manufacturers furnish in the price of the main instrument. We shall now briefly mention some of the things you want for static treatment if you desire to apply the author's methods and obtain his results.

In order to insulate the static charge in a patient a good platform is as necessary as would be a tight pail to hold water. A sieve will not *insulate* water long, and the static current will run off of a small sharp-cornered platform with short legs about as fast as water will run through a sieve. The glass legs should

be about a foot high, the wooden corners all round instead of square, the top of the platform should be bare wood and not covered with oilcloth or carpet, and the size should be about twenty-seven inches wide by about forty-two inches long, though these dimensions can vary to suit different operators. Compare this description with your own platform and if you have one of the *sieve* kind get a good one at once.

Platform-rod, chains, and foot-plate are the things required to conduct the static charges to the patient. Without the metal rod some of the most important varieties of static treatment cannot be given. Without the chains the operator must either omit some valuable kinds of treatment or use very inconvenient and difficult means. Better have the simple and convenient chain. Do not use a so-called "safety-link" chain. Use a substantial brass chain with the regular link. All dealers can furnish it. Get a full box so you can detach any length you want—and you will want four or five pieces varying from two to fifteen feet long for assorted uses. The foot-plate is indispensable. If you have none get one at once. If you have only a small one get one at least fifteen inches square with the corners rounded. Do not use a sheet of metal running across the platform. It will tend to interfere with treatment in important ways that it would take too long to explain in print. Take our word for it and use a proper foot-plate with two feet of chain hooked into one side. Do not have it soldered on one side so that you cannot turn the plate over at will.

Another essential is the author's insulated electrode handler presented to the profession in 1893 and not yet known to one operator in a hundred, yet it is absolutely necessary for the practical methods which give me my results, and which all physicians want to equal. Compare it with the old-fashioned chain holder. A trial of five minutes will show its value. All makers of static machines can furnish one, and no practitioner should be without it. It supports the active electrode with the left arm and prevents fatigue of the right, which has only the fine manipulations of technique to direct. It gives steadi-

ness to poise, keeps no chain dangling near the patient, and has advantages that cannot be described. They must be seen to be appreciated. Suffice it to say that no one can duplicate my skilled work without this simple and wonderfully convenient instrument. But be sure that the one purchased is rightly made, for some have been sold that were useless.

Two sizes of spark ball electrodes are necessary. If yours are made with a short stem they are defective, and proper ones must be had before fine work can be done. The amount of current an electrode will carry depends on the area of its conducting metallic surface. To use small electrodes with a large machine cuts down the actual value of the entire apparatus. Makers till now have furnished electrodes that were very deficient in this important respect, but all the leading makers in the United States have recently accepted the author's models as standard electrodes, and will supply them to physicians. All old sets of wrong design should be discarded at once and a fresh start made in improved work with improved tools and methods.

It is important to have the correct model of point electrodes —single and multiple—for the author's breeze and spray effects with metallic conductors. Note that they require efficient areas of surface. Compare our design with the "toothpick" type of point electrode so long mistakenly supplied with static apparatus. Unless the electrode will carry current in ample quantity the breeze and spray discharge will not be ample. You cannot get a quart of water out of a pint pail, and a thin, short point will not give a full dose of current even if you have a machine that cost $750. It reduces the best machine to the level of a pony machine, and that is working on a hind-side-before basis. Get proper point electrodes. Also keep them polished for use and do not impair skilled methods by tarnished electrodes.

Our next need is a valuable set of wooden electrodes for spray work. *Dry* wood will not conduct enough current to count in therapeutics, but by the addition of different amounts

of water, dampening the wood more or less according to the quantity of current we want to conduct and discharge, we secure a very cheap and efficient supplement to our metallic electrodes. Every one should have these. Dampen one a little, another wet a little more, and saturate a third. Then test the different actions with different manipulations of the electrode and with all ranges of current. The experience will soon teach what to do with them and how to control the dosage. Few physicians have used wooden electrodes efficiently heretofore, and many contradictory teachings are printed about them. The facts are more simple than printed matter indicates. Try the same methods that you use with metallic points and understand that the lesser conductor is merely the means of discrimination in *dosage*. Dose your static currents for indicated effects, and there will be no further "mystery" in this type of electricity. Do no therapeutic work without careful regard to dosage—as much so as with strychnine, mercury, belladonna, arsenic, salines, acids, etc., and for the same reasons and according to the same medical principles. That is the only way to prescribe electric currents of any kind. My writings have been teaching how to do it for some years, and all should be informed on this subject by this time.

It is important to procure the proper design of what is called the massage-roller electrode. It is wide in order to make the broad contacts desired with this application. A narrow and small roller will not cover enough surface of the tissues to be as efficient as one of our large design. Makers have been instructed as to the requirements of a standard size and will supply to order hereafter. All these electrodes are connected with the "handler" for use in treating patients who are insulated on the platform.

Probably three-fourths of the static machines sold during the last few years have lacked the necessary small Leyden jars. You no doubt have a pair of immense jars that are not adapted to treating patients with what are called "Leyden-jar currents." Large jars will not fill and empty fast enough to produce the

rapidly interrupted high tension current that is the essence of treatment with L. J. methods. Hold a big pail under a small faucet and it will not fill fast enough for you to pour out a pail-ful every second, but a thimble will. That is the principle of the L. J. current in therapeutics. You need a rapid succession of discharges, and to get them you must use a jar small enough to fill a great many times a second with the machine you have. Proper jars for treatment are of small size and can vary somewhat, but should have a capacity of about a half pint. They are as absolutely essential as the spark ball electrode, and if not in your equipment do not delay to secure them. For all the local clinical purposes of static electricity by *platform* methods the large jars are not only useless but are liable to annoy both patients and the operator. They should not be left on the machine during treatment, and unless your machine is a small one the large jars have no general value at all. They can be put away where they will not alarm a patient by an accidental discharge when not wanted. Never give a spark with the large jars in circuit. Much of the complaint against sparks was a mystery to me until I went West and saw the way jars were used. Save trouble and needless irritation by taking them entirely off the case during breeze, spray, and spark treatments.

The telescoping rod secured to the left-hand corner of the top of the case and suspending a fine group of sharpened copper needles by a foot of medium wire is another essential device for carrying out important methods of treatment. Every machine must be equipped with it if the physician wants to duplicate our best results. The large crown diffuses the current while *concentration* is indicated, hence the bunch of fine points is far better. This electrode cannot be used so well on a stand such as is often pictured. Experience will teach why the rod is superior. It must be grounded for use.

The stand and long rod pointed at one end with a ball at the other is needed for the important method of my Interrupted Charge, which was called Potential Alternation for some years. This treatment is the most effective tonic method that can be

employed as a general charge, and therefore all should have the means of administering it. The point of the electrode can be used on a few occasions for a stabile breeze or spray, but such technics require a dose regulation which can only be controlled by hand-guidance and we rarely use the stand as it was originally intended by those who introduced it.

Another important device is the author's "Sparker" electrode. No instrument employed with the machine is more satisfactory or needful when cases require it. It is used with important methods for local applications with the author's System of Interrupted Static Current, and also may be used as a medium for sparks without sensation to the patient except the contraction of the muscle caused. It has two ball terminals of different sizes for different contacts, and when connected to one pole of the machine the other end is applied to the situation for local treatment and the dose is regulated by the shunt spark-gap between the sliding poles. The direct current is used without Leyden jars, the platform acting as the condenser. Its use constitutes one of the series of methods described by the author in 1893 and now greatly popularized under the name of "Wave Currents." A great variety of regular electrodes, such as are used for faradic and other currents, can be employed with the interrupted static current by the author's methods.

The author's mono-polar rectal electrodes are used with the same current as the sparker. They are one of our most important contributions to electro-therapeutics. Physicians who have procured them often say, "They are worth their weight in gold." They certainly are worth getting and using. They require only one contact. They avoid exposure. They perform an extensive range of work, and they give satisfaction. Many essential directions, far more complete than can be written into a pamphlet, are at the service of those who want them, in my little work called "Elements of Correct Technique," which contains 320 pages, covers static, galvanic, and faradic currents, and is sold for $2.50. When time permits we shall again take up the whole subject of static electricity and write for the profes-

sion a worthy treatise on this great agent which shall be in keeping with its medical importance. The plan has long been in mind, but the multiplicity of duties prevents its being immediately carried out. The one-fourth part of the story of this type of current has never been told in print, for we must remember that the single machine is the source of five great branches of therapeutic work, each important enough to make the fame of any other single apparatus. Were the methods of use widely known as we teach them it would revolutionize the views of the medical profession, and if we live to present our full Static treatise to practitioners they will realize the force of our statement made ten years ago, that the rightly handled static machine is the most valuable single therapeutic instrument in the whole range of practice. The next thing to it is the fine X-ray coil with a full set of attachments for high frequency treatments, but not more than two or three such equipments yet exist in America, and the general use of X-ray coils in therapeutics as the half-brother of the static machine has its career before it. Some day will witness the accessories of the coil in every hospital and in hundreds of private offices, but not until more physicians read what we tell them of their value. Only a few learn the facts each year. Yet a single year ought to suffice to make a good thing known to all.

Besides these ordinary means of application we employ an ingenious binaural electrode adapted from the stethoscope by Dr. Ritchie, formerly a student of the author's and now one of the most progressive workers in the fields of the eye and ear. This electrode can be connected with one or both ears and the dose exactly regulated. The rapidly interrupted static current is used by the author's System of 1893, and the action set up differs from motor-massage in being the penetrating mechanico-dynamic action of an electric current instead of the action of a surface application only. The shunt spark-gap should begin at zero and be carefully increased until the desired effect is reached, maintained for one or two minutes or a little more, according to the case, and then reduced to zero. The

regulation of speed, rate of frequency, intensity, duration, etc., are governed by the usual therapeutic principles and easily understood. Sometimes a few slow contractions are set up for a special purpose. The spark-gap in most cases will not exceed a half inch, and will vary from one-fourth up to one-half inch. The nicety of precision with which this dosage (as well as all others in our technique) can be quickly adjusted would surprise surgeons who have not witnessed the work of an expert. When we assert that the Static machine is an instrument of scientific precision we do so because we know exactly how to make it do exact work in therapeutics.

We shall not add here a long list of the useful things we take from the kitchen to serve us inexpensively in static treatment, especially with water-bath contacts and our interrupted currents, but those who want to read further will find some mention in our little book of instructions in Technique, and when time permits we shall bring a full and illustrated description up to date in each of the five subdivisions of static therapeutics. Such a work would crown and close our missionary work with the pen, and we feel that after acquiring the great experience so happily ours we should not let the records die with us. It is only a question of finding time to carry out the exceedingly difficult undertaking, for a superficial book is not wanted and a thorough and complete book is hard to write, and the more we learn about the immense subject the harder it looks.

Before passing to the next subject we intended to speak of the importance of the author's "treatment cloth," which every static operator needs for the regulation of dosage in all local applications that call for control of the resistance covering the tissues. These are certain sprays, frictions, massage-roller and other effects which have been fully taught by us in our clinical classes since 1896, and will be finally described and illustrated in our next complete treatise. To us this dose-regulating cloth has literally been worth its weight in gold and is indispensable to all who expect to duplicate the results we easily obtain. We

still use the original piece first introduced by us as a part of necessary static equipment in 1893, for it does not wear out and will last a lifetime.

In order to assist the author in preparing important statistics regarding the development and present use of static electricity in the United States every physician who sees this chapter is requested to write the author the number of revolving plates in his machine. Also to kindly give the names and addresses of other physicians of his acquaintance who have static machines. This will greatly oblige the author. Simply address him at "New York City." No street address is required.

CHAPTER VII.

X-RAY METHODS.

Directions for Fluoroscopic Examinations. Directions for Radiograph. Photographic Directions for Beginners. Directions for Therapeutic Applications.

In ordinary practice the accessories which may be considered a necessary X-ray equipment are the following: Three to six tubes, a rigid tube holder, an adjustable table, a large and small fluoroscope, protecting foil, and the usual connecting wires and photographic material. An increase of work in this field will add a great many things to the initial outfit.

Special variations in tubes for special work now make it impossible to offer satisfactory information about what tubes to first procure. Next year may see other improvements and a book is not the place to speak of variable apparatus. Consult the leading dealers for latest information. The past few months has witnessed some very ingenious devices for localizing action in therapeutic tubes, and buyers can find out all about them from importers and jobbers with whom they deal.

There are three branches to X-ray work: fluoroscopic examinations for diagnosis, radiographic exposures for diagnosis, and therapeutic applications of the rays for the treatment of certain diseases. There is also the related action of low vacuum tube discharges with the high-frequency attachment now made for static machines, and the ultra-violet ray "lamp" which utilizes the very short thick Leyden jar spark for the same purposes as the Finsen arc light apparatus. Thus the static machine possesses a variety of usefulness not rivalled by any other single device in medicine, for it supplies us with the platform methods of treatment, the parallel of all that is best in faradic actions, the whole of X-rays, the major part of high-frequency currents,

and an important part of the therapy of ultra-violet rays of light. When we are able to take up the subject as we plan we shall teach all that is known on every phase of static electricity, but at this time we must be content with a few notes to our early contribution to the subject.

Directions for Fluoroscopic Examinations.—The careless use of the fluoroscoping screen without regard to placing the field of the tissues in the center of the axis of the rays and so that they will pass straight through the part is of little diagnostic value. There are certain rules to follow in correct work.

The flat surface of the fluoroscope must be firmly pressed in closest possible contact with the part which is about to be examined. The physician's eyes must be kept shut a couple of preliminary moments in order to let the retina get used to the dark. As you shut your eyes press the opening of the fluoroscope steadily against your face so as to exclude all outside light.

Have the field under examination and the screen of the fluoroscope held with the same regard to a right-angled path of the rays that you observe in exposing a plate for a radiograph. The rays must pass perpendicularly to the plane of the screen with the axis of the rays always in a straight line with the center of the field of tissues directly in front of the eyes. For certain purposes shut one eye to secure a more exact sight of a limited focus. Do not tilt the fluoroscope up and down or to the right and left during an examination, but maintain it in the central path of the rays and move the tissues along and into the illuminated field which is anatomically free from distortion. The author's X-ray chart illustrates all correct fields at all distances from the focus and will show at a glance the principles involved in accurate inspection of a part.

In making inspection of a part for diagnostic purposes the density and relation of the shadows seen in the fluoroscope must be altered by the technique of the operator till he best sees what he is looking for in the given case. This is done by altering the distance between the patient and the tube so that

the degree of penetration required to suit the examination is found. Then complete the inspection at this distance.

Directions for Radiograph.—To make a radiograph the principles of exposure are the same for each and every part of the body. The amount of what we may call the "dosage" of radiance must be regulated to obtain the desired result, just as a photographer regulates his light and time to suit the picture he is taking. With varied intensities of radiance X-ray pictures range from "snap-shot flashes" to time exposures of from two seconds up to ten minutes for most work, while a few pictures will even yet require twenty minutes with apparatus less efficient than the best. The regulation of time and degree of radiance is governed by the density or comparative difficulty of getting the rays through the part so as to exert chemical action on the photographic plate and create the shadows which constitute the radiograph. Beginning with an easy object such as the hand and progressing by tests and experiments up to the more difficult work of pelvic and thoracic structures and the detection of calculi the operator can teach himself the adjustments of dosage on which effects depend. When he has done this he is ready for practical X-ray diagnosis.

Secure the tube in the holder so that the diagonal face of the anode presents towards the part of the body which is about to be radiographed. Connect the anode terminal with the positive pole of the static machine by a conducting wire and the cathode terminal to the negative pole by a similar wire. Support and spread these wires by a non-conducting rod called a "spreader" which keeps them from sagging or interfering if they are heavy. If light ordinary copper wire such as is used to connect the cells of a galvanic battery is used, no support or spreader is needed, for the wire is stiff enough to be bent into position and stay there.

Place the tube about twenty inches from the film for ordinary work. As thick parts of the body are examined do not have the anode nearer than about twelve inches from the exposed tissues. With thin parts and short exposures the tube can be

less than the above distances. Start up the current and test the working of the tube so as to know its exact present state. Then stop the machine or short-circuit the poles so as to cut out the X-rays and bring in the film or plate that is to be used. Select a plate large enough to take in all the field under examination. Put it in the black and orange envelopes in the dark room so that the film is against the smooth side of the light-proof envelopes. When brought into the operating room lay it film side up on the examining table and put the part on it with the most important tissues directly resting on the center of the film and in the closest possible contact with it. Then shift the tube so that the central focus of the rays is perpendicularly over the center of the film. Start the current into action and with the fluoroscope look at the tube and see if it is working as desired. With the watch note the time and at the desired moment short-circuit the poles to cut out the rays, slip the plate from under the part, take it to the dark room, and if not to be developed immediately, return and dispose of the patient. If a second plate is wanted to test a different exposure-time, bring it in at once and proceed as before. Mark each plate with a record which will serve for reference. In all radiographic work the patient must keep the part still during the exposure, just as in taking any photograph. Movement produces blur. The whole of the clothing can be removed from the part, or in many cases undergarments can be left on for the protection of the patient from chill, etc. See to it that no buttons or metallic articles are left in the field of the radiograph if there is any liability of confusion resulting from their shadows. Do not aim at the shortest possible exposures, but strive to secure the picture which best serves the purposes of diagnosis.

In order to know afterwards just where the focus of the tube was centered, lay a small disc of metal on the film directly under the axis of the rays when the exposure is made. The single principle involved in avoiding distortion in X-ray shadows and photographic images is the exposure of the part so that the field of diagnosis is centered on a plate which lies at

right angles to the perpendicular axis of the rays from the focus of the tube. You secure this relation of the factors by the manner in which you place them for the exposure.

The patient can stand, rest in the recumbent position, or be placed in any posture that the picture requires. Always have the surface that would be nearer the eye in a visual examination placed nearest the film for the X-ray picture.

Photographic Directions for Beginners.—Photography is familiar to many physicians who need no further information about it, but to those who have never developed a negative some rudimentary instruction is necessary. If a few experimental attempts are first made with small plates the process will become sufficiently known to succeed with larger and more important plates and the newer and special X-ray plates and films. The nearest photographer will often be willing to give a medical acquaintance the few details of manual technique which cannot be got out of a book very easily. Developers are a confusing subject to a novice, but each brand of plates is accompanied with formulæ which the makers know to be suited to their productions. Ordinary glass plates have been largely superseded by special X-ray plates and by what are called "Positive Films." "The latter can be used as negatives as well as positives. A positive print can be made with an exposure of one-half to three seconds, according to the density of the negative. Developing the positive takes one minute, fixing five minutes. None of the routine delays of former methods occur. The positives are semi-transparent, permitting the most perfect examination for foreign bodies, dislocations, etc."

Take two small (5 x 7) plates wrapped in light proof envelopes in the usual manner. Handle all plates by the edges or glass side only. Do not touch the film with the fingers, but dust it off with a fine brush to remove possible specks. Lay the pair of plates side by side on the operating table directly under the tube. Adjust the tube sixteen inches above the central line of the two plates. Have an adult rest the left wrist on one plate and the right wrist on the other. Neither wrist will be in the

axis of the rays, but for this test the divergence is immaterial. Take the fluoroscope in hand, darken the room, and start up the machine so as to secure the full X-radiance which the given tube will readily produce. Observe the action of the tube through the fluoroscope and become so accustomed to doing this that gradually the relation of exposure-time to the state of the tube and intensity of radiance will be familiarly and accurately known. If the amount of rays and their penetrating intensity is large the chemical action on the film will take place with great rapidity. But if the dosage of rays is small the exposure must make up in time what it lacks in intensity, and this cannot always be exactly done. Record the time of all exposures till practice makes perfect and compare results of different degrees of radiance.

In this first test give the plates, say, two minutes. Cut out the current with the author's "short-circuit stick," remove the hands from the plates as soon as the X-rays stop and take the unopened plates in their envelopes to the dark room to develop. Close the dark room, light the ruby lamp, and take out the plates. Place them both at once in the developer tray, films uppermost. Rock the tray instantly and keep the solution in gentle motion over the plates during entire development. Bring the ruby light near enough to see all the changes that take place, but take care to avoid too much light or the film will fog. In two or three minutes lift the plates from the solution and look at both sides to become accustomed to the gradual darkening of the film and development of the image. A slow rather than too fast a development is advised when details are sought, but with a properly timed plate and good solution the process takes very few minutes. On the other hand a weak and under-exposed plate and a slow and coaxing solution can consume half an hour in the attempt to get the best possible result in the negative.

When one plate has become fairly black on the back when held between the eye and the ruby light, rinse it well in running water and drop it film uppermost into the fixing bath of

hypo. You can make this as directed on printed matter supplied with the plates you buy. Fixing does not require rocking. Develop the second plate still longer until it becomes considerably blacker by the transmitted ruby light. These pictures require more development than camera photographs, and many beginners spoil an otherwise good negative by under-development. When you think the second plate is at the maximum of blackness and before it shows the least sign of fogging from too much chemical action take it out, rinse, and deposit in the hypo.

As the plates remain in the hypo solution the face, which was at first white by direct light, will gradually darken and in twenty or more minutes will be entirely black. Until the last trace of white disappears the plates are not "fixed." Watch the process carefully in your first experiments so as to find out what takes place. Leave the plates in the hypo for an extra ten minutes and then take out and wash in running water, or in water that is repeatedly changed. Let the cold water run over the entire surface to wash out all traces of chemicals which, if left on the emulsion, will soon alter the negative and spoil the picture. With a tank or basin supplied with running water no personal attention is required in this process and the plates can be left in the tank for a couple of hours. Then take them out and stand on edge to dry. Drying is best done where there is a current of air and no dust. Quick work can be done by putting the plate in front of an electric fan to dry.

When the plates are dry hold them to the light and note that the one first removed from the developer will lack "density" and possibly be quite faint. The plate which was developed longer will be much better, but to avoid errors of under- or over-developing when practical work is undertaken the beginner should repeat this instructive experiment with two or three other pairs of plates with different time-exposures, and in this way learn as nearly as possible what he can depend on with his apparatus.

Directions for Therapeutic Applications.—The action of X-rays

on the tissues is cumulative if treatments follow each other before effects subside, and this is desired up to the point of sufficient therapeutic action. Beyond this point control and limitation of effect require stopping the treatment till results mature. Therefore, the interval between treatments is an important factor in the dosage. Abundance of rays with penetration proportioned to the nature and depth of the tissues in which action is to be set up are more efficient than the higher degrees of radiancy often wanted for diagnosis. Many cases have been treated with so small an output of X-rays that they would be useless for diagnosis. The principles of technique are as follows:

1. Protect the surrounding field so that the rays will reach only the diseased tissues.

2. Clear away any possible hindrance to the free penetration of the rays, as they do not exert active therapeutic energy through resistances which cut down their dosage very much. Use no opaque dusting powders on the lesion while applying X-rays. The production of a local anæmia assists action but is seldom necessary.

3. Place the diseased field at right-angles with the path of the rays and center the focus the same as for a radiograph, though less exactness is required. The chief action is in the axis of the rays. Slanting rays are less effective. The sun's rays act in the same manner, as all know who compare early morning heat with the afternoon of August.

4. Place the tube so that the wall is four to six inches from the surface of the tissues. If reaction is too energetic move the tube farther away.

5. Begin with an exposure of five minutes daily for three days for a single area. If more than one area requires treatment pose them separately and treat each five minutes. After these test treatments continue three times a week until some definite effect or reaction suggests modification of frequency or intensity. At the first sign of over-action stop treatment. Resume exposures as results may indicate, again watching for

effects, and stopping when aggravations occur. In this way conduct a case to a termination in recovery, or the nearest possible approach to it. After some experience with the given case the tolerance of the tissues will be ascertained, and exposure-time can be increased as judgment dictates. Ten minutes is a prudent limit. Go slow and sure.

6. Assist results by such adjunct treatment as may be suggested by special indications.

Smearing the skin with vaseline preparatory to the exposure tends to protect from too easy irritation. Lead foil with a small alloy of tin is prepared especially for X-ray work and a layer, or several layers, fitted over the field with a hole cut to expose the lesion is a common means of protecting patients. Some use a thicker sheet of lead with a thin sheet of aluminum covering the hole bordering the lesion, the rays being passed through the aluminum to reach the diseased tissues and the lead protecting the surrounding parts. For treatment of cavities protecting specula are offered of various materials, metal, glass and celluloid. Special tubes with prolongations which reach into the cavity and direct the active rays exclusively to the parts and which require little adjacent protection are also made and bid fair to reach a higher development than tubes of the ordinary shape. Localization of therapeutic action thus becomes exact and simple and many of the inconvenient requirements of early treatment promise to be done away with.

Operators who use high degrees of radiance for long hours daily can protect their hands and nails by wearing rubber gloves and keeping as much as possible at a distance from the tube. Special box-containers for tubes which permit the exit of rays only in a limited path directly upon the plate or lesion will also avoid operators' chronic trouble with the hands. At the earliest sign of irritation it is relieved by soaking the hands in a hot solution of bicarbonate of soda for half an hour.

The milder forms of dermatitis occurring during treatment with X-rays are managed by at once stopping exposures and by the application of soothing ointments such as allay a sunburn

or burn by caustics. "Burns of the first degree" are benefited by the continual application of an ointment of boric-acid with ten per cent of lanoline. If pain is severe add fifteen grains of antipyrine to the ounce. Orthoform is also recommended to relieve the pain. Hot, moist, mildly antiseptic dressings, used early in burns of the second and third degree, help to limit the extent of ulceration, and, used later, to hasten the process of repair. When ulceration has developed the treatment is about the same as in other forms of ulceration and some patients try all sorts of powders and dressings with more or less relief.

In explanation we may here state that our recent work on six different sections of therapeutic apparatus does not deal with static therapeutics apart from X-rays. The principles of using X-rays do not differ with the source of electric current. They are the same for coils and static machines. All who have static machines will find that they can carry out the same methods which are reported by users of coils. No part of any of my other books is repeated in my Pictorial System of Instruction in X-Ray Methods. It is an original and new work. The X-Ray Chart Supplement supplied with each copy shows the following points of interest to the X-ray operator at a glance:

1. A Plane Diagram of X-Light radiations from the anode focus point.

2. The rate of departure of X-Rays from a parallel path at different distances from the tube.

3. The proportionate loss of right-angle shadows at different distances horizontal to the perpendicular axis.

4. The area of non-distorted field of observation at any distance from the tube.

5. The area within which a body of any thickness will shadow a right-angled relation of the parts at a given distance from the tube.

6. The distance from the tube at which a part and the photographic plate must be exposed to secure essential correctness and non-distortion for a given diagnostic field of any given size.

7. The general area of approximate non-distortion on the plate.

8. The obliquity of shadows at all distances outside of the central field of exact perpendicularity of radiation.

9. The field of maximum therapeutic activity at all distances from the tube.

It is designed to hang on the office wall for daily reference. The section of the same work on High Frequency currents contains instructions regarding low vacuum tubes and some of the most recent applications of static electricity outside of platform methods. The matter regarding high frequency coils also applies to static machine attachments now in the market.

The foregoing directions are sufficient to start the beginner in his first X-ray work. The five chapters on this subject in our original Manual have become too old in the six years since they were written to permit us to use them here. Our latest personal devices and instructions are so fully contained in our Pictorial System that we cannot duplicate them in this small work. Any reader desiring to go beyond the rudimentary directions in this chapter may refer to our large treatise.

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NEW YORK

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These resources of special treatment take the physician into a new realm of therapeutics, a new world of clients, improved results, and the secondary financial benefits of enhanced reputation, for in the long run "good medicine is good business." Scientific therapeutic apparatus unlocks the door to many of the problems of the practitioner, and releases him from many of the anxieties of professional life, for whatever will benefit his patients will eventually benefit the doctor.

The progressive practitioner who *does something* for his office patients has a great advantage over the conservatism which adheres solely to prescription and advice. This fact concerns every member of the profession, and suggests two questions: 1. What apparatus of approved therapeutic usefulness will enable the practitioner to supplement his prescribing, impart greater benefits to his patients, elevate or increase his practice, and thereby earn a better living? 2. How can he learn to use the apparatus without attending an expensive school for clinical instruction?

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OPERATIVE (apparatus) therapeutics as an adjunct to internal prescribing has to-day an immense field of usefulness in a great variety of sub-acute and chronic cases in nearly every branch of practice. The need of improving office business and methods is

admitted. The limitations of drugs are known. Authorities emphasize the fundamentals of rational practice—sunlight, pure air, judicious food, heat, cold, water, electricity, massage, rest, exercise, etc., and modifications of these which are generated, intensified, and made dosable by means of scientific apparatus provide Operative Therapeutic Instruments, which possess much of the *precision of surgery.*

This System of Instruction is therefore designed for all physicians and surgeons who treat patients in their office, and for sanitariums. It covers the broadest field of practice, both general and special. It will touch at some point the interests of every practitioner in the land. Much of its teachings will possess striking novelty for those whom it is intended to benefit. Its revelations of practical resources may well astonish, but must inevitably attract the majority of students, for not one in a hundred has yet investigated the facts set forth.

The Specialist demonstrates that a prime foundation of a prosperous office practice is *Apparatus*, and the family physician may wisely take a leaf from the same book : but what apparatus to get, and how to make it pay, is not so readily settled off-hand. These clinics have been prepared to solve the problem.

The X-Ray Therapeutic Chapters

contain full directions for the X-ray treatment of superficial cancers, lupus, rodent ulcer, hypertrichosis, parasitic and other skin diseases, this method now exciting world-wide interest in the medical profession. The section on X-ray Therapy is alone worth many times the cost of the book.

You

will purchase this great work some time, without doubt, for it is a necessity in every surgical and medical office. Do not wait, but order now and begin at once to profit by the instruction. The six branches of clinical teachings cost but the small sum of $2.50 each.

Remember, that one method acquired from this work may earn ten times its cost. But the work teaches *scores* of methods, many of them not described in any text-book in the market.

A Special Feature of this Work is the Supplementary

X-Ray Divergence Chart

FURNISHED with the Instruction Courses without extra charge. Lithographed in black and red on fine chart paper, 14 x 20 inches in size, and prepared especially to be hung upon the office wall for ready examination by the physician. The design and instruction of the Chart are original with Dr. Monell and it is a valuable novelty in X-ray technics.

This Chart shows at a glance the following points of essential interest to the X-ray operator:

1. A Plane Diagram of X-light radiations from the anode focus point.
2. The rate of departure of X-rays from a parallel path at different distances from the tube.
3. The proportionate loss of right-angle shadows at different distances horizontal to the perpendicular axis.
4. The area of non-distorted field of observation at any distance from the tube.
5. The area within which a body of any thickness will shadow a right-angled relation of the parts at a given distance from the tube.
6. The distance from the tube at which a part and the photographic plate must be exposed to secure essential correctness and non-distortion for a diagnostic field of any given size.
7. The general area of approximate non-distortion on the plate.
8. The obliquity of shadows at all distances outside of the central field of exact perpendicularity of radiation.
9. The maximum therapeutic field in X-ray treatment of any lesion.

These important facts are portrayed on the Chart. They can be seen at a glance. It shows the normal size of a foreign body which throws an enlarged shadow on the screen or plate from an estimated distance. Much of the information the Chart contains formerly required a mathematician to figure out. For full explanatory description see Chapter XVIII. in the Pictorial System of Instruction. Every purchaser of the work should receive the Chart, which is enclosed for delivery in a separate mailing tube.

SOME FEATURES OF THE WORK

It teaches how to make yourself an X-Ray Expert.
It simplifies X-ray diagnosis.
It tells you how to select good tubes.
Teaches how to pose the patient, fix the part, adjust the tube and make all exposures.
Teaches how to radiograph everything that can be radiographed.
Teaches correct uses of the fluoroscope.
Illustrates new and original instruments for making X-ray work accurate.
Explains and illustrates by original photographs exactly how to treat every case of epithelioma, cancer, lupus, rodent ulcer, psoriasis, tuberculous joint and cutaneous lesion that can be treated by X-rays.
It makes clear just what X-rays can do in the diagnosis and treatment of phthisis.
Every dentist can radiograph obscure dental conditions with the aid of this book.
It gives plain directions for the radiography of gall-stones and renal and vesical calculi.
To the surgeon and physician it is an encyclopedia of X-ray instructions for practical work.
It teaches how to make stereoscopic radiographs and examine them.
It teaches how to examine and interpret negatives.
It tells the beginner enough of development and photographic methods to enable him to become expert by practice.
It tells just how to "localize" all foreign bodies and makes it easy.
Its chapters on the X-ray treatment of skin diseases are what the practitioner wants for his daily use.
Tells how to remove hairs so they stay out.
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CHAPTER XII.

ELECTRO-PHYSIOLOGY.

The actions of static electricity in various forms of application. The importance of familiarity with this branch of the subject. Action upon functions. The chief properties of static electricity determined by scientific investigation before the discovery of galvanism. Cavallo's accurate report. Sedative effects described by Arthuis in 1871. Static electricity as a regulator of functions. Its nerve and muscle reactions. Its effects on metabolism and nutrition. Mechanical effects of the spark. Vasomotor effects. Revulsive effects. Sedative *versus* stimulating effects. Relief of pains. Its great service in nervous and functional conditions and all diseases associated with malnutrition. Its action upon the deeper tissues of the body. Its great penetrating capacity. Leyden-jar currents. Their physiological actions similar to currents from improved induction coils. Rapid and slow interruptions and nerve and muscle effects. How to determine the difference between large and small jar currents by actual test. A comparison of Leyden-jar currents with induction-coil currents in practical use. Length of *séances*. Principles governing same.

The Actions of Static Electricity in Its Various Forms of Application.—No physician of any school can forget his careful training in the important subject of drug action. He may happily forget something about anatomy and relieve his mind of one of the worst bugbears of his college course, but familiarity with drug action must be continuously cultivated throughout every year of medical practice.

It is equally self-evident that familiarity with electric current action upon and within the living tissues is a basic need to the physician who prescribes an electric current therapeutically. Post-graduate study of this subject forms the chief present resource of the practitioner desiring knowledge, but undergraduate schools are slowly taking up the work.

The physician requires facts about electricity for practical medical use and not for mere diversion or prejudice. Among

such facts those relating to current action are of fundamental and never-ceasing importance.

The constitutional effect of simple static electrification depends upon existing deviations from normal within the tissues subjected to the action of this current. Just as aconite cannot break a fever in the case of a patient who has no fever, so the static current cannot manifest its predominant action as a regulator of deranged functional processes of the nervous, circulatory, secretory, and muscular systems in cases which are already normal. A healthy man will observe little effect from a static administration which would warm, energize, compose, and relieve from a dozen accompanying symptoms a patient who had the symptoms to relieve. This may be very elementary teaching, but experience proves that no fact, however simple, can be made too plain.

Endowed with high potential, and extremely small in volume, the physiological effects of static electricity are chiefly modifications of the ordinary vital processes without electrolytic alterations. Static electricity may increase, diminish, arrest, or otherwise modify these functional processes. It affects secretion, excretion, absorption, reflex action, sleep, respiration, circulation, and nutrition. Owing to its enormous electro-motive force and its power of condensation and accumulation, it possesses great diffusiveness, which enables it to affect the entire system in a limited degree.

That static electricity had a decided influence upon the physiological functions is not a discovery of our own times, but was observed before galvanism and faradism were dreamed of. In a work written previous to 1790 we read the following remarks on this subject:

> Electricity, strongly communicated to insulated animal bodies, quickens their pulse and promotes their perspiration. If it is communicated to insulated fruits, fluids, and in general to every kind of bodies that are actually in a state of evaporation, it also increases that evaporation, and that in a greater or less degree according as those bodies are more or less subject to evaporate of themselves, or

as the vessels that contain them are conductors or non-conductors and as they have a greater or less surface exposed to the open air. By increasing the perspiration of vegetables electricity promotes their growth, it having been found after several accurate experiments that such plants which have been often and long electrified have showed a more lively and forward appearance than others of the same kind which were not electrified.

In 1777 and 1781 there were published in London editions of a treatise on medical electricity, by Tiberius Cavallo, F.R.S., in which is recorded all that was known in his time of the subject in hand. The discerning observations here quoted were made at least ten years before the first foreshadowing of Galvani's discovery of a current with chemical and electrolytic properties; and they are not only remarkable for their accuracy, but for the fact that very little has been added to them since. Mr. Cavallo recites as follows:

The remarks made by philosophers relating to the effects of [static] electricity upon the human body in general are the following, viz., that *by electrization, whether positive or negative*, the pulse of a person is quickened, the number of pulsations being generally increased about one-sixth; and that glandular secretions and the insensible perspiration are promoted and often restored when they have been entirely obstructed.

It might naturally be suspected that the promotion of perspiration and of glandular secretion was only the consequence of the accelerated pulse and not the immediate effect of electricity; but the contrary is easily proved by observing that in various cases the quickening of the pulse by other means, as fear, exercise, etc., does not promote those secretions nearly so much, if at all, as electrization, and also the glandular secretions and perspiration are often promoted by electricity when applied only to a particular part of the body, in which case it seldom, if ever, accelerates the pulse.

Hitherto it has not been discovered that [static] electricity acts within the human body by any chemical property, as most medicines generally do; but its action by which it produces the above-mentioned effects may be considered merely as a mechanical stimulation, for it seems to act as such even within those parts of the body which, especially when diseased, are mostly out of the reach of other remedies. . . .

From these observations it appears that the application of [static] electricity does not merely promote any discharge or circulation of

fluids, but rather *assists the vis vitæ*, or *that innate endeavor by which nature tends to restore the sound state.*

It may, perhaps, be ever difficult to explain in what manner electricity assists that natural endeavor, but experience shows the certainty of the fact, and with it we must be gratefully content; for we may apply the effects to our wants, though we may be ignorant of their cause and mode of action.

When an electric shock is sent through any part of the body, an instantaneous involuntary motion is occasioned, which shows that the muscular fibres through which the shock is sent are expanded or in some other manner convulsed. This involuntary motion is also occasioned by sparks.

Further, when a shock is sent through several substances besides the human body, a tremulous motion and an expansion is evidently occasioned, as may be shown by many experiments.

Now all these observations may perhaps in a manner explain the action of electricity upon the organized parts of an animal body by comparing it with the tremulous motion given to tubes of any sort through which fluids are transmitted, in order to accelerate their passage or prevent any stoppage or stagnation which might occur.

In my essay upon medical electricity it is mentioned that from the experience of many it appeared that electrization increases the number of pulsations about one-sixth; but having made many experiments upon myself, I added the following observation in the second edition of my essay in the year 1781, and consequently long before Mr. Van Marum's experiments: "I do not remember that my pulse was ever evidently accelerated by electrization, and yet I have tested the matter at various times and with great diversity of circumstances. In another essay I have stated that by repeated experiments, accurately made by Mr. Van Marum and other ingenious persons, it was found that electrization, whether *positive* or *negative*, did neither sensibly augment nor diminish the natural pulse rate in a healthy man. Upon the whole, therefore, it seems to be ascertained that electrization does not increase or retard the ordinary number of pulsations, and the increase generally observed before may have been due to fear or apprehension. But I am now informed by Mr. Partington, who has long practised medical electricity, that electrization, if not in a sound, at least in an unsound state of the body, augments the number of pulsations considerably."

I will here mention a few hints which may promote the investigation especially of the chemical action of electricity, viz., if it adds any principle to those through which it passes as an acid, an alkali, the inflammable principle, etc.

The observations relating to this point are first, that when any

part of the body has been exposed to the stream of electric fluid it acquires a sulphurous or rather a phosphoric smell which it retains for a considerable time; secondly, when the stream of electric fluid, issuing from a point, is directed toward the palate, a kind of acid taste is perceived.

Now this smell and taste indicate that the electric fluid either alters the parts of the body upon which it excites those sensations or that it carries along with it some other principle which may perhaps be separated from those substances through which this fluid passes previous to its impinging upon the body.

Whether these effects may be increased, diminished, or turned to any use, and also whether they are quite indifferent with respect to medical electricity, are matters that require further experiments and consideration. In various experiments when the electric spark is passed through air or other fluids, especially in the case of tinctures of certain flowers, it shows effects similar to those which the inflammatory principle or an acid produces upon those fluids. The facts have induced various persons to suppose that the electric fluid is phlogiston or an acid, or else a compound of both. But considering that in those cases the action of the electric fluid as an acid or as phlogiston is exceedingly small, and also considering the violence with which it passes through the substance of bodies, the surface of which it usually burns or melts in a small degree, it seems more natural to suspect that the above-mentioned effects are produced by that quantity of inflammable or acid principle which the violent passage and escape of the electrical fluid detaches from other bodies rather than to consider electricity itself to be an acid, which seems to be very unlikely on various other accounts.

It is customary in this age of aggressive bacteriology to discredit the "quacks" (*sic!*) who were the pioneers in electro-therapeutics, but that Tiberius Cavallo, F.R.S., was a scientific and discriminating observer and not an ignorant empiric is evident from the mere list of his literary productions which is affixed.*

* 1. "A Treatise on the Nature and Properties of Air and Other Permanently Elastic Fluids; to which is prefixed an Introduction to Chemistry," 4to, with plates.

2. "The History and Practice of Aërostation," 8vo, with plates.

3. "A Treatise on Magnetism in Theory and Practice with Original Experiments," 8vo, with plates.

4. "Two Mineralogical Tables with an Explanation and Index."

5. "Description and Use of the Telecopical Mother-of-Pearl Micrometer Invented by the Author," 8vo.

6. "A Complete Treatise on Electricity in Theory and Practice, with Original Experiments," in three volumes.

About a hundred years later a French writer, Dr. A. Arthuis (1871), summed up the physiological effects of static electricity as follows:

It induces an acceleration of the pulse, it is singularly *calmant*, eases the respiration, develops animal heat, augments cutaneous transpiration, makes more active the urinary secretion, disperses nervous irritation, and gives tone to the whole organism. It is the great dispenser of equilibrium to the disturbed balance of the system, it increases the vital forces, and augments the energy of absorption. In a word, it excites and facilitates the play of all the functions. It is regarded by those who use it as the greatest regulator of menstruation. The well-being which it instantaneously produces causes those who have once experienced it to wish for a repetition of its beneficent effects.

When, one hundred and forty years ago, it was discovered by the Abbé Menon that the human body loses weight by being continuously electrified for five or six hours, he attributed the loss to the increase of insensible perspiration and tissue change. We now say about the same thing in somewhat different language.

The teachings of modern investigation upon this subject may be fairly stated in the following terms: Static electricity increases the excretion of urea, and lessens the uric acid in the system by promoting oxidation. It increases both the appetite and the body weight when the latter has been reduced by impaired nutrition. It lowers the blood pressure. In ten to fifteen minutes of general electrification, or a few minutes of sparks to the spine, a gentle perspiration ensues, accompanied by a feeling of well-being. When this reaction has been reached the sitting may be ended for the day, in ordinary treatment.

Under the influence of static electricity the heart-beats undergo a change, viz., if slow, they may increase ten to twenty beats per minute; or, if too fast, they may be reduced in number. It tends to regulate functionally deranged temperature. Many cases of neurotic, neurasthenic, and melancholic conditions are found to have subnormal temperatures (97° to 97.5°

F.) before electrification. These states it adjusts to normal, and the patients then usually improve.

The static spark causes groups of muscles to jump. It is a most powerful stimulus to nerve and muscle function, and rapidly imparts tonicity, lightness, buoyancy, and firmness to soft, lax, and enfeebled muscular substance. It first causes a vasomotor constriction, blanching the skin. This soon gives place to a dilatation, and the spot gets red. Frequently a wheal is raised, with a temporary sense of tingling and irritation, which will quickly pass away or be instantly removed by rubbing the part with a little toilet powder. If sparks are applied with sufficient persistence to the same area, a mild papular eruption will often be caused.

Devoid as it is of electrolytic action, the power of static electricity seems to be chiefly manifested as a regulator of *functions*. It tends to adjust to normal action the heart, respiration, pulse, temperature, oxidation, secretion, excretion, nervous irritability, and sleep. It increases metabolism so that a person can absorb more oxygen: and this mere improvement in nutrition is a vast power for good, and alone suffices to correct many morbid states: as gout, rheumatism, neurasthenia, neuralgia, anæmia, and various symptomatic derangements.

The spark, by its powerful mechanical disturbance, sets up a great molecular change and acts as a stimulating massage. It thus affects the nutrition of a part, disperses exudation material, and promotes absorption. Thickenings of joints, tendons, and muscles, localized œdemas, effusions, etc., are reduced by strong, thick static sparks.

With fine, rapid, frictional sparks may be obtained the beneficial effects of counter-irritation upon the skin; and with a special electrode a blister may be created in from one to four minutes, if desired.

Sedative or stimulating effects are equally under the operator's control, and may be obtained at will.

Many varieties of pain are promptly relieved by some form of static electricity; and if not due to an incurable or persisting cause, it is wellnigh certain that the pain-killing property of this agent will give permanent relief, if treatment is persevered in long enough.

As a concluding summary of modern opinion upon the action of static currents, I will repeat here an abstract of the report of the committee on "Standard Electrostatic or Influence Machines" presented to the convention of the American Electro-Therapeutic Association, and published in the *Times and Register*, December 29th, 1894:

The committee stated that the report was one of immense comprehensiveness and could only be scratched on the surface in the short time allotted. The physiological effects of static electricity are pretty much all that are produced by all electricity. It sets free the potential energy of the cells of the human organism. That is, it excites the cell in such a way that its inherent energy is liberated. Its wide range of effects vary with and depend somewhat upon the manner in which it is applied.

It causes contraction of the protoplasm, both animal and vegetable. It excites nerve fibres, nerve cells, and nerve centres. All of them are excited to functional action and caused to produce their separate effects—motor, sensory, special sense, secretory, sympathetic, vasomotor, etc.

It has a mechanical action. It disturbs the molecular arrangement of tissues and causes a new structural arrangement, resulting in modifications of nutrition.

It has a cataphoric action and can be made to transfer metals and convey medicaments into the tissues.*

Its general effects are of great range and astonishing importance. They may be briefly stated as follows: It promotes nutrition of every part it excites; produces marked local and general circulatory effects, and stimulates the vasomotor nervous system. It promotes metabolism and tissue metamorphoses; creates a feeling of refreshment to the system; causes the reabsorption of exudation material of a chronic nature and has a revulsive action upon the skin. It is both a cutaneous sedative and counter-irritant, and

* In 1872 Arthuis described metal transference and advocated the use of silver, iron, and other metals in the usual electrodes. Practically no use is made of this suggestion.

makes a powerful peripheral impression of great value in neurasthenia.

The subject of reflex pains is of constant interest to a physician. Pains are often referred by patients to points distant from their origin. Possibly a pain travels along the path of least possible resistance, and in its outward path it prepares the way for the return of a curative influence along the same path. No matter how far from the local irritation a reflected pain may manifest itself, spark the sore place and the impression will track the pain to its seat and drive it out. We cannot cure altered structure, but we can correct functional pains, and often relieve organic pains by setting up powerful ingoing impressions and displacing the pain.

The list of diseases in which static electricity can be beneficially employed is a long one. Its great fields are nervous and functional conditions. In cases of malnutrition it is an excellent tonic. Neurasthenia, hysteria, neuralgia, nervous headaches, etc., are rapidly controlled by it. In cord diseases it affords relief from various forms of pain, even when lesions are advanced beyond cure. It is invaluable in muscular rheumatism, chronic synovitis, and chorea. It is one of the best general tonics we possess, and as such is easy and agreeable of application, and can be used in a great variety of cases. In the treatment of paralysis of curable forms it is one of the most successful agents we have.

It should be noted, however, for the better understanding of those who are not practical electricians, that these interesting effects attributed to static electricity are neither invariable nor absolute, but depend upon and are influenced by concomitant conditions, just as drug action varies under different circumstances. For instance, in a cold office, and with a patient with habitually cold extremities and lack of vital warmth, we may discover little sign of the perspiration spoken of. It may therefore be stated that the demonstrable physiological effects upon any given case will be modified by the individual idiosyncrasy of the patient, the apparel worn, the state of atmosphere in the room, the electrical output of the machine, the method by which it is applied, and the duration of the sitting.

The great electro-motive force of this current gives it almost unlimited power of penetration, accumulation, and diffusion. When the machine is in action and we interrupt the continuity

of the output by a series of sparks anywhere upon the conductor, every particle of atmosphere in the room is thrown into vibration, and vibration is set up in the tissues of the patient. A person now seated upon the platform may feel with his extended hand the atmospheric commotion synchronous with the passage of each spark, and the person's hair, if sufficiently long, will exhibit the same oscillations to an observer. If we imagine every nerve fibre and blood-vessel in the electrified subject undergoing the same intense oscillatory stress, we can readily understand one aspect of its effect upon circulation and nutrition.

It was formerly the fashion to call in question the penetrating capacity of the static current and to claim that its action is limited to the surface of the patient's body. It is curious to see how such a contradiction became so deeply rooted in the literature of electro-therapeutics, for a very simple argument will prove the reverse.

This argument may take several forms, of which it is sufficient to present one, viz.: It is not claimed that galvanic and faradic currents pass only on the surface of the body between two applied electrodes. It has long been admitted that they both penetrate into the tissues beneath the skin. The resistance of the air, however, is so infinitely greater than that of the skin that neither galvanic nor faradic medical currents will pass between two conductors separated by an air space of an inch or any appreciable portion of an inch. Now, it is well known that the static discharge will pass through several inches of atmospheric resistance; and if a patient be seated upon a platform at the usual distance from a Holtz machine, but without any conducting attachment to it, he will be sufficiently electrified to yield a perceptible spark. I have frequently measured the distance at which the breeze from a point electrode can be felt, and found it to be upward of forty inches. Metallic bodies, thirty or more feet removed from an operating machine, are influenced.

After witnessing this exhibition of a power of overcoming resistance so enormously surpassing the power of either current which admittedly penetrates within the human body, the theory of surface limitation is difficult to maintain. A rifle bullet that will pierce steel armor will hardly be stopped by a wooden shingle.

Moreover, the original theory of surface action started from the physical laboratory and had no relation to action within human tissues.

When we consider the countless evidences of high potential, the spark, the excitation of a Crookes tube which neither the galvanic nor medical faradic battery will even glow, and the vigorous muscular contractions set up by the interrupted static current, we have only to wonder that the curious transposition of fact regarding its self-evident voltage was ever allowed to find its way into print.

Leyden-Jar Currents.—The physiological actions are along the same line as the actions of improved high-tension induction coils.

It is often stated that this form of static current is in fact superior to any coil. It is also sometimes stated that every application of faradic currents can be duplicated by Leyden-jar currents. In practice these opinions are not quite true.

Without taking into account any exact difference of maximum potential between coil currents and Leyden-jar currents (for the medical dosage will always be regulated to the case in hand), it is proper to say that a slowly interrupted current from either an improved coil apparatus or Leyden jars will do about the same therapeutic work. If a common faradic battery is in question it must be stated that the Leyden-jar current outclasses it entirely in every respect; but that is because the common faradic battery is an inferior appliance and should be no longer considered as a therapeutic instrument.

When we take into consideration a very rapid interruption of the current, then the finer coil apparatus (such as the au-

thor's) presents some qualities which the Leyden-jar currents lack.

Both rapid and slowly interrupted Leyden-jar currents are adequate for all therapeutic applications upon the surface of the body which relate to ordinary nerve and muscle effects. But if the physician will test the splendidly even and smooth action of the rapid vibrator current from my induction-coil apparatus by the bipolar electrode held in the hand, and by a telephone receiver held to the ear, and then make the same tests of the finest Leyden-jar current that can be obtained, he will discover that it is inferior for sedation effects upon inflammatory tissues and especially for employment within the pelvis. It is manifestly too rough and ragged, and is interspersed with secondary discharges, and an unevenness which is inseparable from the manner in which the static current is produced. It may be used within the pelvis in subinvolution with slow interruption, but I would not consider it suitable to gynecological practice with the bipolar electrode for sedative effects.

Leaving this branch of work aside, therefore, and considering external applications for the most part, it remains to say that the well-understood physiological actions of coil currents differ in no respect of importance from Leyden-jar currents.

When a slowly interrupted Leyden-jar current stimulates a motor nerve it causes a muscular contraction. This contraction will be more powerfully manifested at the negative electrode when both are of equal size.

The electrodes employed with Leyden-jar currents may be either bare metal or covered with sponge or felt, and do not differ from those employed with faradic currents. They are attached to the terminals of the machine by the usual conducting cords, and although a pair of extra long hard-rubber handles is usually furnished with the machine, they are a luxury rather than a necessity, for any handles, or no handles at all, will serve the purpose.

It must also be said that the single pair of sponges which

are the regulation equipment of every machine are but the most primitive beginning of a full equipment of assorted electrodes which the physician will require if he attempts to employ Leyden-jar currents for all the purposes of faradic currents.

If the plates of the machine are revolved very slowly, and periods of less than one hundred per minute are regulated in current strength to a therapeutic dose, the contractions of muscles set up by this means will alternate with relaxation and rest, and the nutrition and strength will improve. This is the way to restore the function of a partly paralyzed muscle.

If the plates are made to revolve faster so that the frequency of interruption will be several hundred per minute the muscles cannot relax and rest, and the current strength, which was comfortable before, will now be unendurable and quickly produce fatigue and pain, for the muscles will be overworked unless the current strength be reduced to tolerance.

If, however, the plates are made to revolve still faster so that the periods will be somewhat increased and the current strength reduced to tolerance by reducing the spark gap, an excellent gross-massage effect will be produced by passing the roller electrode over the surface of the body.

If the rate is doubled and the method of general faradization is employed, the same effect will be produced with the Leyden-jar current as with the induction coil, and if the periods are now made very fast and the current strength adjusted to produce a comfortable thrill over the surface and mild contractions over motor points, a general tonic administration will be made which will combine circulatory and vasomotor effects with nerve and muscle reaction.

The physiological effects of Leyden-jar currents are not varied in their specific nature by different individual properties of small, medium, or large jars. The academic discussion of Leyden-jar discharges, and whether they cause "painless" or "painful" muscular contractions, does not demand serious attention. I have never read anything on the subject which was not con-

fusing to the novice or filled with erroneous statements. Any physician can connect a pair of jars of any size and test different regulations of length of spark gap and rapidity of interruptions for himself, and five minutes of such information will be worth more than all the discussions that have so far been reported.

The fact is that the *maximum* capabilities of current condensation differ with the surface area of each size of jar, and a large jar has a greater capacity than a small jar; but as it fills up from the same electric source with exactly the same current and is never employed in medicine except with an exceedingly small fraction of its utmost capacity, it follows that any expert operator can regulate a desired dose so that no blindfolded person can tell what size the particular jars in circuit are.

When any Leyden-jar current is properly regulated to a medicinal dose and is interrupted with a maximum of rapidity, it is a high-potential, high-frequency current, and develops the physiological effects attributed to such currents. These are described fully in another chapter.

They unite upon nutrition the good effects of exercise, warmth, increased blood supply, and fine vibratory massage. They are circulatory, muscular, and nerve stimulant, tonic or sedative, according to the manipulation and dose.

The patient must disrobe sufficiently for the purposes of a given application, and moistened electrodes must be placed in direct contact with the skin. One or both of these electrodes may be held stationary or moved about, but as the methods are similar to faradic therapeutics I need not describe them, but will refer only to the action during the passage of the current.

It is possible to secure the following physiological effects from rapidly interrupted Leyden-jar currents: They contract blood-vessels as well as muscles, increase peristalsis in all non-striated muscular fibre, stimulate every part of the nerve, whether cell or fibre, excite nerves of special sense, quicken the

circulation and glandular secretion, combat blood stasis, relieve congestion, and promote the absorption of effusions and the eliminations of products of waste. The processes of oxidation are quickened, the elimination of urea, carbonic acid, and water is increased, and incomplete food combustion is more completely carried on.

When these rapid vibratory impulses are directed with the flow of the blood current they reinforce the vermicular movement of arteries and the functional activity of nerves. In the reversed direction they retard the normal current through blood-vessels and nerves.

These currents relieve pain in the same manner that induction-coil currents relieve pain; they are useful to every possessor of a static machine; but in practice they are very seldom employed. The portability and convenience of the smaller and eminently satisfactory high-tension induction-coil apparatus as shown in Fig. 2 gives it a certain superiority for practical work which the Leyden-jar current does not possess. The theoretical merits of the latter are not denied, and by any physician who possesses a good static machine and only a poor faradic battery the Leyden-jar currents should be preferred.

Owing to the fact that it would be a work of supererogation to repeat in this book the entire therapeutics and technique of faradic currents, I have deemed it sufficient to set forth the chief physiological actions and leave those who wish to employ Leyden-jar currents therapeutically to pursue the faradic methods with which they are already familiar.* There is no difference worth speaking of in the technique. There is, however, one other important reason why they are so seldom employed when their merits are admitted. To the man who possesses no static apparatus the coil current is the only alternative. But the physician who already has at hand the source from which

* Full descriptions of these operative methods are contained in the author's work upon "The Treatment of Disease by Electric Currents," a handbook of plain instructions in the uses of galvanic and faradic apparatus.

his Leyden-jar currents would be obtained if he desired to use them, has other applications available which dispense with the removal of clothing, and which not only do many things that the Leyden-jar currents cannot accomplish but include within

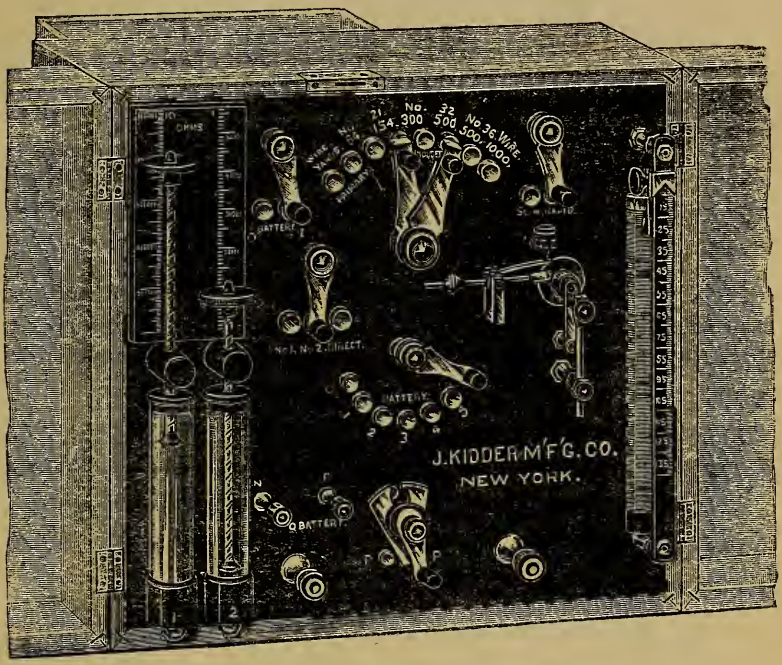


Fig. 2 Represents the Author's High-Tension Induction Apparatus. This improved therapeutic apparatus embodies the following features: An upright switch-board with posterior invisible compound induction coil, approximating 8,000 feet of 36, 32, and 21 wire coils, permanently fixed over the primary helix; the author's original secondary current controllers and primary rheostat; the author's method of dose measurement; an interior battery of six dry cells; also rapid and slow interrupters, pole reverser, adjustable magnetic field, switches, etc. A complete description of this apparatus, written by the author, was published in the *Times and Register*, August 25th, 1894, and an account of the method of dose measurement appeared in the New York *Medical Record*, December 21st, 1895.

their sphere of action almost the whole practical range of utility belonging to the more troublesome method.

I have made an attempt to explain this matter very clearly and at some length because there is some confusion on the subject, and physicians who read desultory references here and there do not obtain much helpful information to enlighten them.

Length of Seances.—In all electro-therapeutic applications of either galvanic, faradic, or static forms of current, the length of the sitting is always a factor in dosage. The physician will always ask himself what the proper length should be, but in the beginning of his experience he may puzzle over the answer.

The fact is that electrical effects are dependent on intensity of action, and the time limit must carry these effects to the desired point and then stop. Time and intensity are not convertible terms in the uses of either electricity or heat.

To illustrate: Take a hot oven that will bake biscuits properly in fifteen minutes. Call this unit of heat one, reduce it four times and multiply the time the biscuits are in the oven by four. One-fourth of sixty minutes is still fifteen minutes, but the result will not be a well-baked pan of biscuits. During their hour's sojourn in the lukewarm oven they would be simply dried and unfit to eat.

Now multiply the unit of heat by four and reduce the time limit in proportion and we would find that the great intensity of heat action now going on in the oven would not properly cook the biscuits in three and three-quarter minutes, but would burn them so they could not be eaten. These principles apply to the uses of electric currents in medicine and the exact regulation of intensity and time becomes instinctive with the trained operator, although it is exceedingly difficult to write directions for the explicit guidance of the beginner.

What is here said about heat effects relates most closely to the chemical polar action of galvanic currents applied with bare metal electrodes, but the idea conveyed is applicable in principle to all medical currents.

Stimulation is generally a quick process and the application short, for over-stimulation is not desired any more than exhaustive fatigue is indicated when we recommend beneficial exercise to a patient. Therefore the application of static electricity by special methods for the particular purpose of either local or general stimulation involves short sittings of a few moments.

Counter-irritating applications are regulated as to time by the same principle and are very short.

General tonic applications of static electricity involve slower-acting methods and take more time. Probably fifteen minutes is an average length of treatment for this purpose.

Sedation involves an opposite principle and still slower method when the condition attacked is extreme, and present relief must not only be obtained but more permanent effects aimed at.

Local circulatory sedation is often as quickly affected as local stimulation, but these remarks are directed to neurasthenic and hyperexcitable general states rather than local. Time in these cases must be extended beyond short *séances* and persisted in until effect is secured, whether it takes twenty minutes or half an hour.

In a doubtful case a few additional moments is a safe allowance, for we cannot over-soothe, over-rest, over-refresh and vitalize an exhausted nervous system.

In the treatment of every such case I compose the patient upon the platform in the most comfortable manner and enjoin the most silent and relaxed state of the nervous system. Sociable gossip is entirely out of place while such a patient is on the platform, for the nerve forces must be placed at rest and in harmonious action with the current to obtain the best results. Recumbent rest for a time after treatment is also advisable. Management of these cases is as important as direct current action.

While some of the effects of static electricity are quickly and with wonderful facility obtained, yet it must be borne in mind that chronic and obstinate cases fall to the lot of the electro-therapeutist, and what is said in this book about the results of treatment can be accepted as true only upon the basis of intelligent, persistent, and often very hard work to obtain them.

In 1777 Robert Steavenson published a brief treatise in

Latin upon the subject of static electricity which contained this short extract of clinical wisdom:

Before we bring this part of the dissertation to a close, it must be observed that doctors seldom persevere in the use of electricity with sufficient diligence, for we ought not to forget that though electricity removes some diseases all at once, and as if by magic, still in others it must be used with long patience; and though the patient may have received no benefit from it after two or three months' use, still success is by no means to be despaired of, for it has removed, even after six months, diseases which could not be cured otherwise. But Shenstone says, "*Patience is a panacea; but where is it to be found and who can swallow it?*"

No physician who employs static electricity should attempt to deal with difficult and chronic cases in short *séances*. The times given throughout this book will be a fair average for the expert with a powerful static machine and the machine at its maximum of power.

If the machine is not cared for and operated so as to represent this degree of efficiency, longer sittings will be required to secure the same results. Skill has the twofold value of economizing time and securing good clinical effects.

CHAPTER XIII.

THE THERAPEUTICS OF STATIC ELECTRICITY.

Operative conditions required for success. Indications for static electricity in general. Its uses in the surgeon's office. Its practical utility in the treatment of general diseases. Limitations which regulate its actual use. Disrobing for general electrical applications. The value of the static machine in office practice. An illustrative case. Relief of minor ailments during chronic treatment. Clinical remarks.

In all that is said by the author in these pages, both as regards technique and results, to be reasonably expected from static electricity, it is presupposed that all proper operative conditions are fulfilled.

The static machine must necessarily be of the large therapeutic size, must be kept in maximum working order (dry and clean); the room must conform to the requirements of this high-potential and variable current, and the operator himself must perform his part.

No fine mechanical apparatus does its best work when new. A steamship, an engine, a typewriter, a motor, a fine watch, and a static machine all require an adjustment, regulation, and "breaking in." Having possessed at various times each of the three modern types of large static machines, and having passed through dog-days with them all, I am obliged to say that no machine I have ever operated has done its best work as it came new from the maker's hands. Having, however, learned by experience the idiosyncrasies of each apparatus, and offset them by the resources of operative ingenuity, I have succeeded in procuring a powerful and abundant generation of current without any further interruption worth speaking of.

I attribute justly a large measure of my uniform ability to

obtain a working current on every day in the year, even though located in a rather damp climate near the ocean, to the fact that I have not trusted the machine to chance and a workman's adjustment, but have personally revised it to the maximum point of efficiency, and thereafter constantly given it the equivalent of care that would be given a good horse by a man who expected it to do regular work. Neglect never develops high efficiency.

It is also assumed throughout these pages that good conduction is maintained between the apparatus and the patient, that the current is not wastefully leaked away from the prime conductors, that the groundings are correctly made, and that all electrodes, the platform, chains, etc., are as they should be. A good current may be cut down one-half by a bad platform alone, even if there is no leakage from the prime conductor, and it may be mentioned in passing that of four platforms purchased by the writer in different years but one was entirely satisfactory in clinical use. A platform may fail in either of two ways: by poor insulation or by bad conduction.

The master of all that pertains to the satisfactory operation of the splendid modern Holtz machine has very little trouble with it; the tyro is in trouble continually. The obvious remedy lies in obtaining the requisite instruction in operative management before attempting to treat patients.

Indications.—The theoretical range of therapeutic indications for static electricity is nearly as wide as disease itself, for at some time in almost every important deviation from health it can be employed with benefit to the patient, if the physician and patient so desire. It may be usefully prophylactic before lessened tissue resistance furnishes the nidus for definite disease; it may in some form palliate, and in other cases cure, a great many states of sickness which are not toxic or febrile; and when no active part befalls it in acute stages it will do much to shorten a tedious convalescence.

In the surgical office it will light up a Crookes tube more

radiantly than any other present means of electrical excitation, and with the fluoroscope or photographic plate make the examination of fractures, dislocations, and a variety of bone lesions more satisfactory and instantaneously than any other means.

It will often relieve the nerve and muscular effects of traumatism, allay local inflammations, subdue pain, restore the circulation to contused parts, quicken the reparative processes of nature, increase mobility of stiffened muscles and joints, provide a superb form of passive motion and massage, excite recuperating contractions in muscles paralyzed from injury or the inaction of splints, tone up and strengthen the patient, and in expert hands will render with quick facility and with far less trouble than any other equally efficient procedure an immense amount of invaluable aid.

It is the most extensively useful single instrument now employed in medical office practice for the relief of non-operative and non-septic conditions, and is absolutely without a therapeutic rival in the complex and useful nature of its achievements.

It may be granted at the outset that certain conditions of disease and certain pathological states will never, or very rarely, enter into the consideration of static electro-therapeutics, so long as its employment is inseparable from the physician's office. Acute infectious fevers and contagious diseases are examples. Such affections as in an acute stage are rendered worse by exposure to outdoor air are of course other examples, and also cases in which neither of these conditions operate, but which are accompanied by symptoms which render recumbency and rest essential.

Thus by a simple elimination of classes of cases, such as will occur to the mind of every experienced practitioner, including conditions in which the result of time-tried remedies leaves little or nothing further to be desired, we define the limitations which practically determine the uses of static electricity.

We therefore find its chief field of usefulness in the treat-

ment of conditions, either acute or chronic, which have to do with nerve action, circulation, muscles and joints, pain, functional processes and nutrition.

From the standpoint of pathology its tissue action is very narrow, but so is that of iron; but both iron and static electricity become of immense practical usefulness from the commonplace fact that a great many people present the conditions which they favorably affect. Phosphorus cuts a much wider swath through the human tissues in its physiological action than does iron, but fifty patients need ferrum where one needs phosphorus.

Yet, operating within the boundary of its proper restricting limitations, it will be observed that the same static machine will accomplish much more in some hands than in others. There are in every department of mechanics certain workmen who have the knack of getting exceptional work out of ordinary tools. I have seen watchmakers with an elaborate outfit of costly implements whose skill in using them was much less than their cost, and I have seen others with but a few plain tools who would handle successfully any job on the workbench.

This difference in the native knack of men will always influence both the variety of work done by the static machine and the satisfaction with which it is utilized in individual practice, for it cannot be too strongly impressed upon the mind that it is the presiding genius and personal ability of the operator, and not the intrinsic resources of the machine, however great, on which rests the successful application of static electricity. This is the explanation of many of the failures and disappointments recorded against the static machine of some years ago, and it is equally in force to-day.

Disrobing for General Electrical Applications.—A careful study of the causes which operate to render general electrical applications distasteful to patients, and repugnant to physicians in ordinary office practice, places disrobing in the front rank and leads me to emphasize here an advantage possessed by

static electricity which is of surpassing and even incalculable importance in practical electro-therapeutics: *it requires no removal of clothing.*

Minor or limited local applications of galvanic and faradic currents may readily be accommodated to the necessity of surface-contact electrodes, for exposure of the person can either be avoided or restricted in extent. But both physician and patient may well stand aghast at the mere thought of general administrations of any form of electricity which involve both the drawbacks of disrobing in an office and the application of the hand or moist electrodes to the entire person. These drawbacks, relating both to the disrobing and to the treatment, cannot be appreciated at their full weight without experience with cases suffering from pain, deformities, paralytic affections; or fashionably attired women; or persons whose failing faculties, crippled conditions of limbs, or sensitiveness to the appearance of undergarments make it difficult, embarrassing, or practically impossible for them to undress and dress themselves again in an office.

To the therapeutist who recognizes the usefulness of general electrization in a large proportion of all cases in which electricity is indicated at all, it is simply despair to contemplate galvanic and faradic methods for constitutional, tonic, and nutritional effects.

The usual alternative in practice is to disregard them and wholly ignore the benefits they would produce. This alternative does not confront the possessor of a Holtz machine, and the facility with which an expert can by its aid employ the resources of general electrization without any of the loss of time and inconvenience of disrobing, puts the stamp of practical superiority upon a form of current whose properties are peculiarly adapted to general administrations for sedative, tonic, alterative, restorative, and nutritional effects.

A considerable clinical experience convinces me that I can treat ninety per cent of cases amenable to benefits from any

form of general electrization more successfully, quickly, and with more permanent satisfaction by the aid of the static machine than by currents requiring the application of electrodes to the body.

Granted an equal therapeutic value, the current which may be applied through the entire clothing possesses an advantage over all others. It is this advantage which belongs to the static machine and which places it prominently among the necessities of a complete electro-therapeutic equipment for general medical and surgical practice. The indispensability of both galvanic and faradic apparatus has long ceased to be open to question, and when the technique of the third great therapeutic instrument is once mastered, it will be found equally indispensable.

The Utility of the Static Machine in General Practice.—In an article upon the nutritional effects of vibratory electrical administrations by the author's method, published in January, 1896, I remarked that I valued the medical services of electricity far more for its utility in a thousand practical every-day cases than for its power to slightly benefit an advanced stage of some rare and incurable lesion of the central nervous system.

An example of the practical value then referred to will illustrate electro-therapeutic resources available to every physician and surgeon.

Mrs. ——, aged 72, weight two hundred and forty pounds, twenty years ago fell and fractured the left patella; later broke it a second time, with resulting non-union, and the fragments are now separated by one-half inch. She walks unsteadily with a cane and frequently falls. She always fears that her leg will give way under her. Has pains in the limb and severe coccygodynia from one of her falls, when she struck forcibly on the coccyx some years ago.

She has had for the past month an intense facial neuralgia of the right side; is unable to eat solid food, and scarcely able to open her mouth to take liquid nourishment, as the pain is worse from movement of the facial muscles. From loss of sleep and nourishment she reports herself "discouraged." It

was for the neuralgia only that she came to me for treatment. She had "tried medicine" without relief and had been advised to "try electricity."

Her unwieldy weight, great age, irritable state, and impatient disposition from extreme suffering made the removal of her complicated winter garments out of the question. Accordingly, while the facial neuralgia might be relieved by a galvanic or coil current, the treatment of the spinal and leg pains and muscular debility could not be undertaken with locally applied electrodes; nor did the patient expect to be treated for these conditions as she regarded them as incurable.

My method was much simpler than local faradization and far more comprehensive. Without even untying the strings of her bonnet or removing her winter cloak, I seated her upon the static platform and connected it with the negative pole. The positive pole and brass point electrode were then grounded to the gas fixture. A sedative spray was applied to the facial nerve-distribution from the ear to the mouth, holding the electrode just far enough from the face to avoid a spark (about two inches).

The spray was moved gently over the seat of pain until relief was complete. The same electrode was then shifted to the spine, and anodyne counter-irritation applied by sweeping the point up and down the painful parts just near enough to scatter fine spray discharges, interspersed with minute needle-like sparks. When this region was relieved, a few thick positive sparks were then applied to the lumbar and sacral region, and to the muscles of both the injured and other limbs, to increase their tonicity and thus compensate in some degree for the impaired leverage of the patella and lack of exercise.

Duration of *séance*, eight minutes. Time required for preparation of Mrs. ——, both before and after treatment, and getting ready for the next patient, was less than one minute, for it consisted merely of getting her on and off the platform and starting and stopping the machine.

Sittings were repeated three times a week in this case, although daily treatment at first would have been better. At the fifth visit she reported that she could eat bread comfortably and that her back and legs felt no more pain. At the sixth visit she wanted to know if she needed to come any more, as she "felt so well." After the seventh treatment she was discharged, with entire relief from all pain and considerable increase of muscular energy. Several weeks later she sent a grateful message that the benefits had continued.

The points of interest in this case relate to the improvement in walking obtained by strengthening the general leg muscles without regard to surgery for the patella, which she said she was too old to consider; the relief of pains in both back and lower extremity without the removal of any garment; the relief of the facial neuralgia; the immediate consequent improvement in sleep and nutrition, and the transformation of an irascible invalid into a comfortable and genial old lady.

A therapeutic apparatus capable of such services in short sittings of about ten minutes, with a minimum of trouble and no exposure of the person, demonstrates its practical value in a physician's or surgeon's office.

Moreover, many of the over-refinements of faradic and galvanic technique described by former authors to secure particular nerve and muscle effects are unfamiliar procedures to the general practitioner. He cannot remember them when he wants to apply them. If he has a static machine and knows how to use it, he need never regret their unfamiliarity in such cases as I have above described.

Relief of Minor Ailments During Chronic Treatment.— The value of the knowledge of how to relieve many of the minor but annoying symptoms of disease by some form of electrical application does not of course depend upon the demand for such relief by patients not already under treatment for more serious conditions. Very few practitioners and certainly few of the laity are aware of half that electricity will do to relieve or entirely remove a large number of small troubles that flourish in chronic diseases. The electro-therapeutist will not expect that patients will come to him instead of the family physician to be relieved of small aches and pains; but when the physician in either general or special practice commands the entire resources of galvanic, faradic, and static therapeutics, and is treating the more serious conditions which bring his patients to him, it is of inestimable value and a source of great comfort to be able to ward off so many of the minor acute

or chronic grumblings of the system that distress the patient and often delay the case. Relief can frequently be given with little or no extra time or trouble during the course of the major static application, and it is for this reason that directions for combating a number of trifling ailments are included in this book. With this fact properly understood, the apparently "cure-all" nosology of leading treatises on electro-therapeutics would disarm the sceptic's smile and obviate much of the criticism that has long been directed against an agent of such complex properties as electricity. The fact that this agent can be caused to do more therapeutic work within the tissues than can drugs of single or simpler action sometimes appears unreasonable to medical minds familiar only with drugs and unacquainted with electro-physiology.

Without dispute a simple prescription would also relieve some of the symptoms above referred to, but it is not less to the credit of electricity that it is able to afford the relief without the prescription. The theoretical mind may not discriminate between the two methods, but in general practice the advantages derivable from the complex and varied potentiality of the static current constitutes as great a benefit to the patient as does its efficacy in some of the incurable diseases for which electricity is usually recommended after other remedies have altogether failed.

Clinical Remarks.—In any protracted course of treatment the best effects are secured, not by adherence to a routine, however particularly indicated it may be, but by occasional changes of current and method. Constitutional electrization may nearly always be beneficially engrafted upon local measures, and for this purpose a well-handled static machine works in harmonious alternation with the galvanic and faradic currents Nature, in health or disease, often revolts at monotony.

CHAPTER XIV.

RHEUMATIC DISEASES.

Lumbago, torticollis, cervicodynia, pleurodynia, and all forms of muscular rheumatism and muscle pains, acute, subacute, or chronic. Method of treatment. Muscular rheumatism and general neuralgic state—a clinical case. Obstinate chronic lumbago and similar conditions, so-called. Articular rheumatism, subacute and chronic. Indications and methods of static treatment. Obstinate and unyielding articular rheumatism. Methods of treatment. Swollen and painful joints without acute inflammation. Rheumatic stiffness and partial paralysis. Sore and tender bony prominences. Rheumatic headaches. Rheumatic derangements of circulation and animal heat. Obstinate lingering pains. Posturing during treatment. Remarks on medication and the duration and frequency of the electrical part of the treatment of rheumatism. Prognosis. Flatfoot. Rheumatism among workers in electric light and power stations. Effects of high- potential and high-frequency currents in rheumatism and malnutrition. Report by Apostoli. Gonorrhœal rheumatism. Rheumatoid arthritis. Medical remedies. Electrical treatment in full. Prognosis.

Lumbago, Torticollis, Cervicodynia, Pleurodynia, and all Forms of Muscular Rheumatism and Muscle Pains, Acute, Subacute, or Chronic.—Seat the patient, fully clothed, upon the insulating platform of the static machine, and connect it with the negative pole.

Ground the positive pole, together with the brass point electrode, to the gas fixture.

Start the machine into moderate action and apply a concentrated positive breeze to the painful part. Gradually sweep the point nearer the surface so that a succession of spray showers will be thrown upon the muscle.

In a moment increase the intensity of the application so that fine needle sparks mingle with the spray. Have the patient attempt such movements and postures as are most difficult to

make and which aggravate the pain. The effect of this positive spray will immediately be warming, sedative, relaxing, and anodyne to the stiffened and sore muscles. In very recent and simple cases such a counter-irritant spray will produce entire relief in from three to ten minutes.

If the case is of a little longer standing slow down the machine, which has gained quite a rapid rate during the spray administration, and apply a sufficient number of positive sparks from the grounded brass ball electrode to complete the relief.

Begin with a very mild spark and increase the vigor gradually until results are secured. Avoid bony prominences about the joints. Apply single, thick, clean sparks directly to site of pains and over adjacent muscles. Apply a few at a time and note the relief afforded. Continue to posture the patient so that every possible aggravation of the pain is caused and in each position apply the sparks until relieved.

Persist until the patient steps from the platform free from pain and walks and moves about with perfect comfort. Never let a case of myalgia get off the platform while any pain is left.

If the case is more chronic and deep-seated and has resisted a good deal of treatment in other hands, proceed at once to vigorous counter-irritation and strong sparks, with the platform connected to the positive pole and the negative grounded. With the brass point electrode throw repeated showers of hot spray upon the stubborn muscles and finish the attack with strong, sharp sparks.

If the lumbar region or an arm is affected, or any part over which the brass ball electrode can be rapidly rubbed a few times to set up an intense stimulation by friction, do this for a moment at the end.

Time required in any case will rarely exceed ten minutes. Repeat sittings daily at first in acute or severe cases. In others, or after partial relief, repeat every second day, or three times a week.

Complete and permanent effects will vary, with the nature of the case, from one to four treatments in mild recent cases to perhaps a month in some that are very chronic.

If static electricity is properly applied to muscular rheumatism and fails to produce satisfactory results, the patient has *some other affection and not* muscular rheumatism. There is nothing more certain in therapeutics than the absolute relief to all forms of muscular rheumatism afforded by electrical currents, and the simplest and most effective current to apply is usually the static.

When we consider other internal and external methods of treatment differently advised in almost every text-book on general medicine, and the uncertain results which many patients obtain from common practice, including hypodermics of morphine, plasters, and liniments, the positive value of static electricity in myalgia cannot be overstated. An eloquent author of "A Practice of Medicine" (1892) devotes a dozen lines of warning against the use of opium in this affection, but his sole reference to the one remedy which is wellnigh an unfailing specific is as follows: "Electricity also has reputation for the cure of these cases, but I have never had occasion to use it."

Muscular Rheumatism and General Neuralgic State.—Miss ——, aged 27 years, five years ago had an acute attack of rheumatism affecting in turn ankle, knee, shoulder, and heart. Her doctor told her that she had "neuralgia of the heart." She has had a continuous career of invalidism for the past five years. Had some uterine condition the nature of which is not now known to her, but after eighteen months of unavailing local treatment her ovaries were removed two years ago, and since that time she has wellnigh impoverished her family by "doctors' bills."

Since September last she has not had two weeks' freedom from alternating attacks of severe muscular rheumatism of all the muscles around the neck, shoulders, and chest, and what she called a sore throat. Sleepless with pain, worn out, and wellnigh utterly discouraged, she has had also to contend with neurotic disturbances that add to the intense agony of the rheumatism and neuralgias.

Liniments, lotions, and the best medical treatment she could obtain during the past five years have failed to improve her condition. Having heard that electricity might give her relief she gathered together her shattered strength and succeeded in getting to my office. She could just keep on her feet. Her head was drawn downward and to the right side, the muscles felt hard and rigid, those of the chest felt so constricted that she was unable to breathe deeply; her throat was swollen, she felt "sore all over," she had sciatic pains in the left leg; her thighs hurt her so much that she could not press them together; she felt intensely cold around the pelvis, quivered under the slightest draught, and was in an extremely pitiful condition. Her neck was swathed in absorbent cotton. She had on a winter cape with a high collar for protection from the cold, and a hat secured on her head with a veil. Her muscular agony was such that she was unable to remove either the cape or hat, and leaving them on she stepped to the static platform. This was on the 8th of March, 1897.

I applied, after a few moments of simple positive electrification, a hot negative spray to the spine, sides of the neck, and upper chest. Pretty soon the head began to straighten up, in three minutes she could take a deep breath, and after a hard-fought battle of twenty minutes she stepped from the platform with a sense of warmth and comfort all over. She had not a pain or symptom left anywhere. This was at 2:30 P.M. She left the office with her head erect and happy; she went home and remained comfortable the rest of the day, and enjoyed a good night's sleep. According to instructions she came again the next morning. Her condition had relapsed in only a small degree. The head was not drawn to one side nor were any of the muscles extremely painful. A second treatment was given with entire relief, and on the next day the third treatment was given.

The transformation wrought by these three sittings of static electricity would have convinced the worst sceptic that it was worth all the other agents in the materia medica for the relief of the worst type of muscular rheumatism if the aforesaid sceptic had witnessed the administration. It is seldom, however, that the neurologist or specialist in any other branch of medicine, who takes it upon himself to brush the facts of clinical experience aside, ever gets near enough to a static machine in

action to see it work, and as a matter of fact bases his statements on prejudice alone.

It will be possible to do a great deal to relieve the neurotic condition of this young woman by the simple aid of static electricity, after her five years' failure to attain health through the attentions of the gynecologist, the ovariotomist, and skilful medical prescribers. Regular treatment for a few months will help her greatly.

Case reported by Dr. W. C. Allen.

Mrs. G——, a lady suffering from acute muscular rheumatism of the right deltoid and trapezius, which had continued about ten days and in the last few days showed signs of affecting the chest and back muscles, was given only one treatment with the positive pole attached to the spray electrode, and the current centred over the affected muscles. She went home that afternoon somewhat relieved, and when she awoke the next morning there was no pain, only a slight stiffness, and that soon left and did not return, and since then she has had many colds, and once an attack of rheumatism in the hip, which I cured in the same way, but there has not been the least sign of a return of the trouble in the shoulder.

Obstinate Chronic Lumbago and Similar Conditions, So Called.—The static spark is very certain to cure all these states that are confined to muscles, but its sphere of action does not extend so well to pains deep in the spinal articulations. It often happens that some final pain resists the breeze and spark in a case of chronic lumbago. When this is observed, and is evidently a joint and not a muscular affection, place the small Leyden jars in circuit and a large sponge or felt-covered electrode both upon the abdomen and over the rheumatic vertebræ. Make the posterior electrode positive, short-circuit the sliding poles of the machine, start the plates into rapid action, and draw the poles just sufficiently apart to produce agreeable sedation.

As relief advances, increase the current strength moderately. Length of sitting, fifteen minutes or until effect is complete. Repeat daily a few times, and thereafter as may be needed.

Articular Rheumatism.—The different manifestations of rheumatism require some adaptation of the electrical method to the patient.

In the general rheumatic diathesis, with shifting pains and irregular symptoms at different times, the static part of the treatment aims at both local relief and at general alterative and nutritional effects. As ordinarily employed it cannot stand alone in the satisfactory treatment of patients whose rheumatism is general and subject to inflammatory relapses. The best results are obtained by assisting the action of electricity with diet and medication, and making the applications daily.

Apply positive electrification in its most efficient form for at least fifteen minutes daily. Add to this such localized breeze or spark applications as local symptoms may require, and as soon as the patient is accustomed to energetic treatment spark the spine and general surface with alterative positive sparks.

In all the varieties and stages of rheumatism, when any kind of medicine is known to do any good continue its use, for electricity interferes with nothing else and supports the remedy. Electricity also gives great relief to symptoms and renders valuable aid in overcoming the diathesis, but in subacute and chronic inflammatory articular rheumatism it must be pushed for effects and employed with discretion and not administered indifferently three times a week.

This is the least satisfactory kind of rheumatism to treat with static electricity. Do not apply sparks to any part within which a slumbering inflammation might be lighted up. The anodyne relief in such a state should be obtained from the breeze and sedative spray and in some cases frictions.

Obstinate and Unyielding Articular Rheumatism.—Cases of rheumatism of a well-known type sometimes persist in spite of all treatment. The patient has perhaps been through some years of experience with medication, proprietary cures, baths, possibly massage, probably galvanic and faradic methods, and finally lands upon the static platform with the rheumatism as

hearty and vigorous as ever, and the patient renewing hope for the tenth or twentieth time.

Treatment is pursued by the usual methods about three times a week, with immediate and grateful improvement. The headaches disappear, the muscular stiffness relaxes, sleep improves. In a couple of months or less the patient has very little further trouble "except in one place." If she "could get rid of that she would be all right."

Each application of ordinary sparks gives some relief and the general improvement has been very good, but finally, having no other pains to divert the attention, the patient concentrates her mind upon the single joint that is left to annoy her and she suddenly has a relapse. The routine treatment three times a week now seems as much of a failure as it previously seemed a success. The patient goes home with a few hours of relief before her and two days of suffering ere she comes again. The rheumatism seems resolved to die in the last ditch before it will surrender to static electricity or any other remedy, and these are the cases in which medicine seems utterly useless except for anodyne purposes. The disease localizes itself and intrenches in some impregnable Gibraltar around the hip-joint, for example, and surrounded by the unyielding fascia lata refuses to be driven out.

What then is the operator to do? Has static electricity failed? *Not always!* It has failed in the manner in which it was applied, but it has ammunition left and fresh reserves. About this time the patient is likely to say that she is pretty near discouraged and would do anything and submit to anything to get rid of the rheumatism. When this is the case the battle is half won.

Arrange with the patient to give you a better chance, to follow up the assaults which have given temporary relief until they hammer their way to the very gates of the citadel and compel an unconditional surrender. Arrange with him, or her, to come *twice a day* for treatment. Connect the platform with

the positive pole. Ground the negative pole and the brass point electrode to the gas fixture. With the machine in rapid action and a gentle use of the hot negative spray (made hot by having the patient wear suitable woollen garments) produce a preparatory warming up of the whole system. Then begin the genuine battle with the joint. Assault it by every device of stimulation, counter-irritation, and muscular contraction that can storm the tissues and conquer the disease.

First, with the brass point electrode and the patient postured in the most uncomfortable position in which the joint can be placed, increase the intensity of the spray around all the thigh, spine, and abdomen, and throw down shower after shower of stinging sparks as the point is swept over and across the tissues.

This is light artillery. Now bring up the heavy guns. The patient says she will "stand anything" if it will only do her good, and the sting of the spark is only for an instant, and these cases prefer it vastly to the continuous rheumatism. Exchange the point for the large brass ball electrode. Increase the current to its maximum energy. Pose the patient in different positions that will set up pain. Have her stand in a partly crouching position to make every muscle tense. At other times flex the limb with the foot upon a stool. Resort to every manœuvre that can develop pain, and in every position rain down upon the obdurate tissues such a storm of grape and canister that there is no alternative but capitulation.

Diversify the heavy sparks with intercurrent frictions over the site of the intrenched disease; allow the patient breathing spells of rest so that no real suffering will be caused by the application, and when she steps from the platform after about fifteen minutes' experience with the maximum capabilities of a well-handled static machine she will declare that she feels like a perfectly well woman. She will sleep soundly and restfully at night and will not only maintain a large part of the benefits of each treatment, but by these frequent and relentless repetitions will achieve as nearly a complete cure as it is possible for any-

thing on this earth to cure obstinate chronic articular rheumatism.

One, two, or four weeks of such treatment as I have here described will accomplish more than six months or a lifetime of routine puttering.

The operator, however, who undertakes such an energetic plan must have his patient in the proper frame of mind and must know precisely what to do and how to do it, for otherwise few patients would accept administrations of such apparent ferocity, although in the hands of a master of technique the treatment is perfectly tolerable and is not seldom interspersed with expressions of satisfaction on the part of the patient.

Leyden-Jar Current.—Still another reserved method which was first used by me four years ago embodies the physiological actions attributed to sinusoidal, alternating, high-potential currents and described in another section of this book.

Take any ordinary foot-tub and put in it a teaspoonful of sodium bicarbonate, a flat felt-covered electrode about ten inches square, and six inches of warm water. Place the medium or small Leyden jars in position for use. Carry an ordinary conducting cord between the negative jar and the terminal of the electrode in the foot-tub. Take also two glass jars or bowls in which the hands can be immersed above the wrist and fill them two-thirds full with the same solution as the foot-tub. Connect them with a bifurcated cord to the positive Leyden jar, which is of course the one connected with the negative prime conductor of the machine.

The patient sits in an ordinary chair with the bare feet in the tub and a wrap of some kind over them to protect from draughts. One of the jars is placed at each side and the hands are immersed. This gives three water-bath electrodes, which furnish a contact that cannot be surpassed or even equalled in any other way.

Short-circuit the sliding poles of the machine. Start the plates into very rapid action, and gradually draw the poles apart

until the patient experiences a comfortable thrill in either the hands or the feet.

Having regulated the current strength to comfortable tolerance, the application may be continued fifteen or twenty minutes.

It subjects the entire muscular and circulatory system to a fine vibratory massage. As this practically includes everything in the body but the bones, it exercises a marked effect upon nutrition, metabolism, and elimination, as set forth by Apostoli.

The method is applicable to gout, rheumatism, uric-acid and all other states in which general nutritional and alterative action is desired. This action is along the lines of a gradual improvement of the patient's condition and has the advantage over sparks that it causes little or no sensory effect. It, however, does not relieve local pain immediately as does the spark or breeze, and these may both be employed for symptomatic relief during the early stages of treatment by the Leyden-jar method.

This plan of treating rheumatism accommodates itself especially well to cases of an inflammatory character, and when the condition is general throughout the body instead of presenting a constant localization. It may be expected to give satisfactory results, or at least develop a very encouraging improvement, in about twenty daily treatments. If the case is so obstinate that it has resisted other measures, and if this plan affords reasonable encouragement, it should be persisted in one, two, or even three months, for those who have spent years in battling with chronic articular rheumatism should not refuse a small modicum of patience and perseverance to any remedy that is helping them.

Case reported by Dr. Franklin H. Clark.

Mrs. H——, married, aged 40, three years ago was attacked with acute articular rheumatism affecting both knees, confining her to bed for two years; also had frequent attacks of lumbago.

During this time all the remedies in drug kind were tried with very little benefit.

After forty applications of the static sparks (these treatments were made daily) the patient could walk fairly well and at the end of three months was discharged cured.

Case reported by Dr. W. S. Watson.

Mrs. W——, aged 37, had had a severe attack of rheumatic arthritis with resulting contracture of left leg, leg flexed to an angle of at least thirty degrees, firmly ankylosed, and of some four months' standing. The joint had been treated by massage thoroughly without any apparent relaxation or benefit. The case was treated by applying the Leyden-jar current, using one sponge under the foot of the affected side, and the other sponge about the joint for five or seven minutes, followed by the long spark from the ball electrode to the contracted ligaments and about the patella.

Fourteen treatments were given, one every third day, when the woman had so completely recovered the use of the limb as to go about freely without the assistance of cane or crutch and was entirely well, notwithstanding that when she came for treatment she was unable to get her foot from the floor.

Swollen and Painful Joints without Acute Inflammation.—To general positive electrification as before, add positive sparks to the knee, elbow, ankle, shoulder, or any other affected part. Begin cautiously, and if no aggravation is caused make the sparks of gradually increasing strength until they reduce the swelling, remove the pain, lessen stiffness, and finally restore all of mobility and strength that appears to be attainable. In these cases, as in all others in which the resources of electric currents are far superior to routine external applications for reflex effects, use no liniments, blisters, tincture of iodine, ichthyol, or any other local, superfluous, or useless application.

In these chronic joint cases static is more effective than galvanic or faradic electricity, and is vastly quicker and easier to apply. The results soon teach patients instinctively to prefer it after a few experiences with "family batteries" and home treatment.

Repeat the sittings as often as necessary to promote the best obtainable state of relief. If pain is severe and the relief from one treatment does not at first last even from one day to another, sittings should certainly be daily, or even twice a day, until the relief lasts longer. It is useless to try to "cure" rheumatism with any remedy that delays its second dose long after the action of the first has ceased. My experience leads me to infer that many failures permanently to improve articular rheumatism with electricity are the results of too extended intervals between "doses."

Rheumatic Stiffness and Partial Paralysis.—To the usual tonic electrification with the positive pole with which each treatment is generally begun add a suitably vigorous application of positive sparks until the stiffened muscles relax and their nutrition and functions are restored.

At each sitting entire relief from any present pain should be secured, with progressive improvement in mobility.

Posture the patient with the ankylosed joint under extreme muscular tension, and if it is the ankle, knee, or hip, have him stand with the entire weight of the body exerted in unison with the sparks. By this method the greatest possible mobility will be obtained. If an arm is affected, exercise the muscles near the joint with slow contractions by a slowly interrupted Leyden-jar current, or by winding the chain around the forearm and arm in succession, connecting it to the positive pole while the negative is grounded, and exercising the arm vigorously by the author's method of sparking the prime conductor.

Apply the sparks slowly for several minutes with intervals of rest to avoid fatigue. The sense of lightness, buoyancy, endurance, and general well-being imparted to heavy, stiff, and inactive limbs by this method is far more appreciable to the patient than the results of any other form of treatment known to medicine.

To establish improvement—which may at first appear to be very rapid and later very slow—the early sittings should be

near together, but can be lengthened to every second or third day as gains permit.

Sore and Tender Bony Prominences.—In the treatment of rheumatic cases with sparks we not infrequently find that some small area of prominent bone at the knee, ankle, hip, elbow, or shoulder joint, or some of the knuckles of the fingers, will be very sore and tender to touch.

The spark is not suited to parts which are not covered with muscular fibres, and is contraindicated. Some physicians have used the spark and complained that it aggravated rather than relieved. So will twenty grains of quinine aggravate a congestive headache to which it is not suited. The proper thing to do is to apply the right remedy, which is the positive static breeze.

During the sitting, with the patient connected with the negative pole, ground the brass point electrode, and have the patient bend the joint so as to expose most sharply the seat of tenderness. Then concentrate upon the part a very vigorous sedative spray, with the plates revolved rapidly, and the electrode swayed gently over the surface, just near enough to make the brush discharge luminous. A couple of minutes is usually a sufficient time. Repeat at each sitting during the course of treatment until sufficiently improved.

Rheumatic Headaches.—I usually devote a couple of moments' attention to a head breeze during the general treatment of rheumatic patients who report habitual headaches. If the headache is present at the time of treatment I continue the application longer until it is entirely relieved, but as a rule nutritional improvement soon takes care of this symptom without any special head treatment at all.

The relief from head pains, which often appears marked by the end of the first week of treatment, is one of the reasons why patients who have long taken medicine in vain appreciate the practical merits of static electricity.

Rheumatic Derangements of Circulation and Animal

Heat.—Some of these cases have habitual cold hands and feet which do not readily warm up in bed at night even with a hot-water bag against them. If the extremities are still cold after the preceding applications I close the sitting with a few very mild and clear-cut positive sparks to the sole through the shoes.

Have the patient keep one foot flat upon the metal tray connected with the negative pole and lift the other foot from the platform with the sole presenting to the operator. After directing about three single and slow sparks to the centre of the most fleshy portion of the plantar muscles, exchange the feet and repeat the process upon the other. Do this two or three times with each foot.

Avoid the sensitive edges of the foot, the heel, toes and toe-nails, and strike the spark directly in the centre of the sole. This not only warms the feet at the time but by a few repetitions tends to keep them permanently warm, or capable of being readily warmed again by the circulation, if they are exposed to cold weather.

Obstinate Lingering Pains.—When rheumatism has been apparently driven from all the system except perhaps a single joint from which it refuses to be dislodged, I cease, after a reasonable time, to persist in the above methods, but pass through the obstinate part a very rapidly interrupted high-potential current from the small Leyden jars or from my coil apparatus; and if this fails or the indications point to the galvanic current, I employ it before discharging the case.

The sedative and alterative effect of these currents upon pain deep-seated between articulating surfaces is much better than sparks will produce.

As a general rule the relief of pain and muscle stiffness associated with chronic rheumatism will be most successfully achieved by the author's habit of posturing the patient during treatment. Two minutes in this way will often do more for the patient's comfort than ten minutes without, and as a matter of fact some patients who are readily given very satisfactory

results by this aid to treatment have previously failed to find "electricity" in other hands beneficial at all.

Duration of Treatment.—The time required in any given case cannot be stated in a book but can be fairly estimated in practice. I have had a patient come to me, after eight weeks in bed with a pretty heroic course of internal and external treatment, and in seven sessions with static electricity cease to have any of the pain, which had before been so great that he could scarcely endure coming to the office. The slightest movement of his elbow and shoulder was almost intolerable before the first treatment, and the lower extremities were partly affected. Within a week from his fourth treatment he was riding his bicycle with comfort.

I have seen very chronic cases without inflammatory tendency lose more than half their average pain after the third treatment and desist after fifteen or twenty applications, feeling that they were about as well as they could reasonably hope to be.

As acute inflammatory cases of rheumatism confined to bed are entirely aside from the subject of static electricity, and as many of our cases come to us after some years of suffering and various methods of treatment without success, it is fair to consider that two or three weeks for the relief of the most favorable cases, with an allowance of from two to four months for the full treatment of medium and severe cases, is not an unreasonable period for the accomplishment of satisfactory results.

From the experience gained from treating a considerable variety of cases with electricity the practitioner will cease to regard the prognosis as a matter of guesswork, but will find that he can very accurately determine, from his first examination of the patient and at his first treatment, into which one of four classes a given case will fall, and whether he will be able to obtain quick, good, slow, or poor results. He will also be able to distinguish to what extent the rheumatic condition is not amenable to static electricity and will support his treatment by other measures.

While there are occasional demands for the local uses of both galvanic and induction-coil currents in the treatment of rheumatic conditions, by far the major portion of general treatment can be preferably done with static. When other currents will do as well in theory, static will do far better in practice by achieving the same results in a shorter time and without the trouble of any disrobing, either partial or complete.

Although medicine is an extremely necessary part of the treatment of inflammatory types of rheumatism, yet in many chronic cases which have never been acute, and in which medication has proved persistently useless, I prescribe no drugs whatever and the patients thrive very well on static electricity every second day or three times a week, after sufficient relief has been obtained to permit the longer interval.

Clinical Remarks.—It is well to remember that pain in the foot may be something besides rheumatism, neuralgia, or gout.

A patient was once referred to me for "galvanism on his heel"—which had pained him constantly for about nine years. He had been treated two entire years with static sparks and had received no benefit whatever. Another physician had told him that he needed "galvanism." I sent him to a shoemaker for support for his *flatfoot*, and afterwards removed the ache which lingered in the arch with a few applications of a positive static spray, administered to both feet at once, for eight minutes at a sitting, by the brass point electrode, fixed upon the standard. He obtained total temporary relief at each application, which gradually lasted longer and longer, and after four *séances* became permanent.

This case illustrates one of the alleged "failures of static electricity to cure rheumatism."

As a side contribution to the clinical study of the dynamic effects of electricity in rheumatism I will include a reference to workers in electric light and power stations. In the winter of 1894–95, while engaged in some experimental work in the laboratory of a central station, I had several talks with the jan-

itor of the building, a man about sixty years of age, who had in his time, he said, been a great sufferer from rheumatism. He was very much interested in the subject and said that for thirty years he had never long been free from rheumatic pains until the last three years. During these three years he had been employed in and around electric-light stations, and had been free from rheumatism. He asserted that not a single workman in the station had the disease, and it was the general belief among the men that the immunity was due to the influence of electricity from the dynamos.

The facts were made the subject of inquiry through an electrical journal having a large circulation among light and power interests, and an attempt was made by the author to collect data from men of practical experience in this field. The replies elicited were very few in number, but one of them was as follows:

To the Editor of ——:

I saw in your paper an article asking for information in regard to what effect dynamos have on persons who have rheumatism. I will give you my own experience, and if it will be of any use to your correspondent I will be glad.

I was born and raised in Massachusetts and can hardly remember the time when I did not have rheumatism. From the age of ten to nineteen years I suffered intensely with it. Then I came to San Antonio, Tex. For two years I was free from it, although out of doors in all kinds of weather. Then it returned again. About this time I obtained work in an electric-light station in Galveston, Tex., which was the first one in this State I believe.

For four years I was constantly at work in this line, two in Texas and two in Detroit, Mich.

During all this time I was not troubled with rheumatism.

After this I was four years on a ranch in Western Texas, in the most healthful part of the State; here the rheumatism returned again, but not as when I was a boy in Massachusetts.

For the past six years I have been again employed around dynamos, and do not have rheumatism, although it is a very common complaint here and I am exposed to all kinds of weather.

I am not around the dynamos to exceed two hours out of the twenty-four.

CHARLES H. EDDY,
Superintendent Electrical Department of the Brenham Compress, Oil, and Manufacturing Company.

In central-station work there is generally no direct application of the current, the workmen simply performing their duty in an atmosphere continually in vibration and electrified from the dynamos and wires. Theoretically we can imagine that not only rheumatism but numerous other states of ill health would be benefited by a residence in an atmosphere that conduces to molecular and functional activity. The physiological effects of currents of high potential and high frequency upon protoplasmic metabolism have been pretty thoroughly investigated and determined during the past five years. They are summarized by Apostoli as follows:

Clinical tests upon more than a hundred patients show that these currents exert in the majority of cases a most powerful and generally beneficial action upon diseases due to *slackening of the nutrition*, by accelerating organic exchanges and combustion. This is proved by analyses of the urine made by Dr. Berlioz, of which the following is a brief *résumé:*

The quantity becomes more normal; the products of organic waste are better eliminated. The increase in combustion is shown by the diminution of uric acid, while the percentage of urea is generally increased. The relative proportion of these two substances changes under treatment so as to reach in general the figure of $\frac{1}{10}$. The elimination of the mineral products is also changed, but in a manner less marked.

When daily *séances* are given, each lasting fifteen minutes, we may generally observe in patients submitted to the influence of these currents the following modifications in their general condition. We mention them in the order of their occurrence.

Return of sleep.

Increase of strength and vital energy.

Increase of gayety, of power for work, and ability to walk.

Improvement of appetite, digestion, etc.

In short, general progressive improvement.

This general improvement often manifests itself after the first *séances* before any local influence is apparent, and before any change has occurred in the urinary secretions.

Local pain and trophic changes are often more slowly affected by these currents, and at times they are entirely refractory for a longer or shorter period and in such cases the same currents must be applied locally by contact with the electrodes, for general electrization by any form of current must be localized at the seat of local pain.

The diseases which have appeared to derive most benefit from this therapeutic agent belong to the arthritic class: rheumatism and gout.

In conclusion, the currents of high frequency and of high tension introduced into electro-therapeutics greatly increase the field of action of medical electricity. *They furnish general medicine with a new and valuable means of treatment, capable of modifying more or less profoundly the processes of nutrition through the vasomotor system and exerting a powerful action upon all living bodies subjected to their inductive influence.*

As the statements of Apostoli are now universally accepted as the most authoritative in the field of modern electro-therapeutics I need advance no further argument to explain the *rationale* of the action of static electricity in rheumatism.

The static machine has been from the earliest day to the present time the chief of high-frequency, high-potential sources of medical currents, and in furnishing also the powerful localizing influences of the breeze, spray, and spark, it stands in value far ahead of any substitute "alternating" apparatus that has yet been devised. The one other available form of high-frequency medical apparatus stops in its facility of application and therapeutic effects about where the most active methods of static action begin.

Gonorrhœal Rheumatism, so Called.—In this class of cases, which come to the office with joint pains and without signs of acute inflammation, I detect no practical difference between them and other cases of rheumatism in the indications for treatment by electrical currents.

Under general nutritional applications of static electricity, and localized applications of the breeze, spray, or spark, adapted to the given case, patients with this clinical form of rheumatism do about as well as others.

If some inflammation is present in any particular joint the local application should be either the sedative positive breeze, or the small Leyden-jar rapidly interrupted and mild current, poured steadily into the part between two ordinary sponge-covered electrodes, such as are used with faradic treatment. In

estimating the prognosis in rheumatism the tendency of this disease to relapse must not be forgotten.

Woods and Fritz, in their "Practice of Medicine," thus set forth the treatment of this disorder: "The treatment of gonorrhœal rheumatism is very unsatisfactory. We have never found the salicylates, colchicum, the iodides, or the mercurials to exert a distinct influence for good. In the acute cases, rest, fixation of the joints by splints and blisters, or the application of the thermo-cautery over the joints, constitute the major part of the treatment. In chronic cases careful attention to the general health, the best possible hygienic surroundings, the administration of tonics and of arsenic, and the use of massage and passive movements, comprise about all that can be done by the physician. The utmost importance should always be attached to the local treatment of the genito-urinary organs; the obstinacy of the disease often depends upon the existence of a slight chronic gleet. The surgical treatment of the inflamed joints, by opening and irrigation, is said to have yielded satisfactory results."

Static electricity does infinitely better than this, and will relieve the patient satisfactorily even if it does not always completely cure him. All the remedies suggested above are inferior to the static current in any stage of the disease.

Rheumatoid Arthritis.—Owing to the generally hopeless medical view of this "terrible ailment," it is considered here more fully than some other diseases.

It is one of the cases in which treatment should be directed to the patient rather than solely to the local joint lesion. The disease is progressive and the prognosis unfavorable under medical treatment, but it is my belief that an improvement of fifty per cent in the local condition and vastly more in the general health can be affected by the skilful use of galvanic and static electricity.

Rheumatoid arthritis may in the manner of its invasion be acute or gradual, and the subjects of it may be rheumatic,

gouty, phthisical, scrofulous, neurotic, or have suffered from some local injury, or from some utero-ovarian lesion; but whatever the variety of disease, there will generally be found a nervous system weakened by anxiety or suffering, depraved digestion, spinal irritability, and anæmia.

I quote the following remarks by Armstrong because they contrast well the usual therapeutics with the simple, practical, certain, and cheering treatment to be presently described.

Important points are: (1) Early diagnosis; (2) recognition of the special variety of the disease with which we have to deal; (3) the use of remedies which will act not only on the local joint mischief, but also upon the original cause of the disease, upon nutrition generally, and especially upon the nervous supply of the joints.

[Can any one name drugs having the above actions wherewith to cure rheumatoid arthritis? The author quoted avoids this point and continues:]

As a rule I have found the following drugs and methods more or less harmful, as are all forms of treatment which exercise a debilitating influence; soda salicylate, potassium iodide, alkalies generally, colchicum, bromides, Turkish, Russian, and vapor baths, and very hot immersion baths, whether mineral or plain. Sulphur, guaiacum, and ichthyol have given negative results.

I have found the following remedies of service: Salicin, quinine salicylate, iodine, iodide of iron, colchicine salicylate, cimicifugin, viburnum, hydrastin, cannabis indica, red marrow of bone, hypophosphites, nux vomica, sumbul, blisters, and cod-liver oil.

My own experience has resolved itself into about the following plan of treatment, which is modified as different cases require:

If any redness, tenderness, and inflammatory swelling are present in any of the joints, immerse the hand deeply to above the wrist in a jar filled with warm water with a half-teaspoonful of bicarbonate of soda added. The salts of lithium are advised by some authors, but I no longer think it worth while to attempt cataphoric medication with this remedy. The results are equally good without it.

Into the prepared jar drop the tip of the positive conductor. If one hand only is affected, the opposite hand in a second similar water-bath may be made negative; but as both hands are usually in the same stage of disease I make both fluid electrodes positive with a bifurcated cord, and press a negative sponge or felt covered electrode, about 3x4 inches area, upon the back of the neck. This requires the least possible derangement of the person's clothing.

Increase the continuous galvanic current gradually from zero up to about ten milliamperes, and maintain this dosage until the most comfortable and complete sedative state in the joints is produced. This may take ten or twenty minutes, but I persist until the effect is secured.

Repeat sittings daily if possible during the first week, or until the pain, swelling, and redness subside. This will usually require a few *séances* only, but the number will of course depend upon the severity and obstinacy of the condition.

At the earliest moment that a mild spark perturbation within the tissues can be set up without exciting fresh inflammation in the joint, I abandon the galvanic current and the trouble of moist electrodes, long *séances*, and purely local action for the greater utility and far-reaching effects of static administrations.

The patient is now seated upon the negative platform with her hands open upon her lap. The dorsal surface is first uppermost. With the brass point electrode and the positive pole grounded to the chandelier I apply a strong, cooling, sedative breeze, concentrated to almost a spray, passing the electrode over each hand within an inch or less of sparking distance. Then up the arm, around the shoulders which are often stiff and painful, down the spine, around the knees which also often ache, and ankles, and to any other locality where stiffness, soreness, or pain resides. When headaches occur, or when the mental state is depressed, a head breeze is included in the *séance*, and when the above-described portion of the treatment is all accomplished within ten minutes I change the platform

connection to the positive pole and close the sitting with an additional five or eight minutes' nutritional, positive, general electrification.

With each succeeding static treatment after the first the composure of the patient will increase so rapidly that the spine and all large joints and muscles affected with pain and stiffness may soon be vigorously treated with mild sparks. In many cases this general constitutional treatment is of much more importance to the comfort of the patient than is any improvement that could possibly be made in the hands alone in the first half-dozen sittings, especially if applications are made no oftener than three times a week.

There is a definite increase in strength, both nervous and muscular. The entire arms gain in mobility and ease, and improvement in sleep, appetite, digestion, and general nutrition takes place, and the mental state becomes hopeful.

During the subsidence of the last lingering tenderness in the small joints of the fingers the passage from the spray application to mild sparks directly upon them must be slow and gradual, although strong nutritional sparks may be given the rest of the body with impunity.

As soon as tolerance develops in the finger joints the hands are thoroughly treated with sparks of gradually increasing strength, going over every joint and muscle of both palmar and dorsal surfaces.

I have indicated above the cautious manner of initiating treatment when sufficient tenderness and active arthritis are present to require care. But the stage of the disease when the patient first appears for treatment is often such that very strong sparks can be given at once without distress, and in that case the necessity for delay in applying them is absent. The hand, however, in health feels acutely the keen sensation of static sparks, as do all parts of the body which are not well cushioned with muscles to soften the impact of the blow; and when tenderness is exaggerated by disease it must first be lessened and

the change from sedative to stimulating treatment must be gradually made. The precautions required to comfortably administer strong static sparks to the arthritic hand become quickly apparent to the user of the ball electrode, and an inquiry as to the sensations of the patient or even a glance at the expression of the face instructs the experienced operator in the regulation of current strength. These sittings are now usually repeated only three times a week.

In the course of time, which may vary from one to two or three months with different cases, the general condition will have improved so far that the patient "feels well," can use the hands and arms for many helpful purposes, and is entirely free from general symptomatic disturbances, even though the critical observer may see little reduction in the anatomical deformity of the fingers.

I now shorten the static application by omitting the first portion of the *séance* and substitute exercise of the hand and arm muscles by a slowly interrupted Leyden-jar or high-tension induction-coil current and two ordinary sponge-covered hand electrodes.

These are first held in the palm of each hand without regard to polarity, except that I generally reverse it so that each hand gets about as much of one polar action as the other, and the current strength is increased until the whole extent of each arm is influenced.

The electrodes are then localized upon the muscles of the forearms and hands, and particularly upon the wasted muscles of the deformed joints. At first three or four slow contractions to each group of muscles are sufficient, and the number is increased as strength and endurance are developed, in the same manner as in treating ordinary paralysis.

The rate of current interruption should be about seventy per minute, and fatigue and painful contraction are always to be avoided upon the common-sense principles of all rational electro-therapeutics.

Any medication that appears indicated can of course be prescribed at the same time, but these patients have usually "tried" medicine and become hopeless about it. Some declare that they cannot take cod-liver oil, and as a matter of fact our clinical experience teaches us that patients who are given no drugs at all get along very hopefully on electro-therapeutics alone.

I continue to alternate the local treatment of the hands between the induction-current exercise of the muscles, and the resolving, alterative, and tonic action of the strongest sparks which the patient can now receive, together with general positive electrization as long as the systemic state requires it.

Prognosis.—As few persons will continue a long course of treatment without interruption it is difficult to say what the ultimate possibilities of correcting an advanced claw deformity would be; but if we judge results by the general gain in comfort, strength, and increased ability to employ the crippled hands and all other affected parts, we find that long before the hands show any marked return of symmetry the patient is expressing both gratitude and satisfaction over the improvement. It is probable that the best results obtainable by any of the resources of medicine can be best and most quickly obtained by the methods described above, when they are applied with due skill and perseverance. Electricity can without doubt successfully displace and far exceed in value all other remedies for rheumatoid arthritis.

CHAPTER XV.

CHRONIC GOUT AND THE URIC-ACID DIATHESIS.

Chronic gout. Usual methods of treatment. Treatment by static electricity. Prognosis. The uric-acid diathesis. The value of static electricity in this condition. Methods of static treatment. Frequent sittings required.

In addition to the ingestion of large quantities of water, the regulation of diet, and the usual medical formula, the treatment of gouty patients is generally supplemented by baths, exercise, massage, stimulating ointments and lotions locally, etc. The treatment of gout is frequently written up at some length and with great ingenuity in suggesting methods by which extra-drug treatment may be best pursued. Every one of the indications cited in various writings which I have examined is fulfilled by static electricity, and the best and safest means of obtaining all the results which can be accredited to all other extra-drug agencies is found in the hands of the physician who possesses a Holtz machine.

If "active exercise" will benefit a gouty patient the energizing static current will prepare him to take it with endurance and enjoyment, and if he becomes fatigued in an excess of enthusiasm his next static treatment will banish the ill effects. If "passive exercise in the form of massage" is indicated, there is no masseur endowed by training or by capabilities of technique with the deeper-acting, more quickly administered, and infinitely superior massage of the static spark. The potential difference between the hand method and the electric-current method is as great as the difference between a hand machine and a steam engine.

If "baths are indicated to aid elimination," I refer the reader to the investigation of the physiological action of electrical cur-

rents upon inactive processes of metabolism set forth in a preceding page. If a joint can be benefited by "an ointment containing iodine, iodide of potassium, ichthyol, or extract of belladonna spread on a piece of lint applied as a plaster and kept in place by a flannel roller bandage," we have simpler methods that are neither greasy nor odorous, covering all the range, from the sedation of an exquisitely painful and tender state to stimulation, counter-irritation, and strong contractions of muscles and ligaments.

Some of the methods advised, especially "a course of baths and massage or a visit to a mineral spring," take the patient out of the hands of the physician, with an increase of expense to the invalid and no compensating advantage to either the patient or his doctor. The static machine, on the contrary, retains the full, uncomplicated control of the patient, treats him more successfully and with less expense than the masseur or the spa, and gives the physician who operates it the combined satisfaction of serving at once his patient's best interests and his own financial necessities for the support of his family.

Seat the patient upon the platform connected with the positive pole, ground the negative pole, and apply general positive electrification for fifteen minutes. After one or two treatments change to potential alternation, as it is the most actively alterative and tonic method.

Upon this nutritional application the local method must be adapted to suit the case. If a joint is acutely inflamed, swollen, and exquisitely painful and tender, the patient will hardly be likely to come to the office and will be treated by the usual methods at his house; but should the condition be such as to permit office visits, the relief of the positive static spray concentrated upon the part for about ten minutes will be a wonderfully efficient aid to the "calomel, colchicum, codeine, and other drugs customarily prescribed." Repeat as often as the return of pain and circumstances indicate. The patient who has once experienced the great relief of the static breeze will want it again.

If the joint condition is one in which "local massage is said to be of great service" the local static application may begin tentatively with sedation, if a low grade of inflammation is suspected to be still present, and the operator may gradually mingle an occasional mild spark with the sedative and alterative spray, but increase the dosage to stronger sparks as the improvement advances. This will massage the joint most effectually.

If there is only deformity present without inflammation it is advised that "the massage may be more vigorous, and movements of the joints with stretching of the contracted ligaments should be frequently and systematically carried out. By this means the deformities, when they are due to contraction alone, may be entirely overcome and the full use of the joint restored. The application to the joint of stimulating ointments and lotions is also of considerable value. Of course, if there are chalky deposits within the joint they can never be removed."

Under these conditions apply to the joint long, thick percussion sparks, carefully regulated from very mild to strong, according to the increasing tolerance of the tissues in the course of improvement. Avoid applying the spark to any node or bony prominence uncovered by muscle if the spark causes any particular pain in this situation.

To affect the gouty diathesis after the patient has become accustomed to spark treatment, close each sitting by a thorough nutritional treatment of the whole body. Go over the spine, arms, abdomen, region of spleen and liver and entire lower extremities with positive sparks.

Frequency of treatment must be governed by the duration of the effect after each sitting. When the improvement is maintained for more than twenty-four hours and is progressive, the applications may be made every second day and later three times a week. When the patient remains free from symptoms and maintains a satisfactory improvement for an interval of about two weeks, treatment may be discontinued until some relapse occurs.

In all this class of cases it is sufficient satisfaction to be able to keep the patient comfortable year after year by temporary treatment whenever symptoms require, but the tendency to relapse would of course be greatly mitigated by adding to dietetic precautions an occasional short course of static treatment at intervals throughout the year, regardless of any apparent necessity.

The Uric-Acid Diathesis.—The medical man who operates a powerful Holtz machine in his office practice possesses a means of mastery over this renowned condition that far surpasses the therapeutics of Haig. The diet-and-drug method strives to adapt the patient to the diathesis, in fact capitulates to it; supplementing these measures with static electricity drives the diathesis out and necessitates no compromise with the powers of malnutrition.

Nerve and muscle excitation are the familiar electrical effects commonly quoted by those who have no other knowledge of electro-physiology, but these are far surpassed in nutritional importance by the decisive effect upon the metabolism of the organism by currents of high frequency and high potential. Apostoli and D'Arsonval have lately demonstrated, and many others have confirmed, this profound effect upon nutrition,* increasing the elimination of urea, carbonic acid, and water by from forty to fifty per cent, and reducing by a corresponding amount the uric acid in the system.

On the one hand the consumption of oxygen is increased, metabolic completeness is increased, and the products of incomplete combustion are diminished on the other hand. It is certainly better therapeutics to dispose of uric acid by carrying its oxidation on to urea than to prescribe solvents which do not lessen its production and which only palliate the evil.

The treatment of these cases by the addition of static electricity to other methods involves the general application of the

* These effects were practically observed and recorded by the careful and accurate investigators of 1770–90. See chapter on electro-physiology.

positive current, preferably by the author's vibratory potential alternation, followed by nutritional sparks to the general surface, and the localization of either breeze or sparks wherever they may be needed for the relief of painful or other symptoms presented by the patient.

While the sense of well-being imparted to the patient in a few moments is exceedingly grateful and may last for a few hours, or the remainder of the first day and night, yet if the apparently prompt relief deceives the physician into short sittings at intervals of only about two or three times a week, the progressive advancement of the case will not be rapidly assisted.

Inasmuch as the processes of nutrition are at fault, and are taxed beyond their functional powers three times a day, it is evident that one treatment in three days has too much against it to permit its successful operation. The improvement which follows a few moments' influence of the current should not only be maintained by treatments of nearly half an hour in length, but the second treatment should take up the benefit and carry it on before it is partly or wholly lost by delay. The most satisfactory results in the treatment of these patients will be obtained by thorough nutritional applications daily, until there is no gain lost by making them every second day. When improvement is established to this point it will soon be possible to finish the case with a few treatments three times a week. Repeat the same when relapses occur.

CHAPTER XVI.

NEURALGIAS AND NEURITIS.

Resources of static electricity. Supraorbital neuralgia. Method of treatment with different forms of static breeze. Facial neuralgia from use of hair tonic containing lead. Neuralgias in general. Methods of treatment affecting different parts of the body. Duration and frequency of application. Prognosis. Sciatica. Successful treatment. Static methods in full. Auxiliary medication. Clinical cases. Comparison between static electricity. the rest cure, and other methods. Traumatic neuritis, and recent or chronic effects of cold and damp.

"So nearly certain is electricity in some form to relieve an idiopathic neuralgia that if proper electro-therapy fails, time will usually show a severe pathological condition to exist in the vicinity of the nerves—as, for instance, neoplasms, an abscess, or some severe general bodily ailment as diabetes" (Benedikt).

The commonly recommended blisters, cups, cautery, rest cure, and all the analgesics of the materia medica cease to interest greatly the physician who is able to command the resources of electrical currents, although at times in the beginning of a very severe case some temporary aid to sleep may be advisable. If also any case of neuralgia presents clear indications for curative drugs they will be given the practical preference by most physicians and patients. The neuralgias that come to the electro-therapeutist are mainly of an inveterate character and have already resisted drug action.

Static electricity contains more than one valuable resource with which to combat, and at least palliate, and often in time effectually cure, this frequent and distracting form of pain. Positive electrification is a general nutrition improver; the positive breeze is a local sedative; the negative breeze and spray

are stimulating, and the friction spark is counter-irritant; the long thick spark is a powerful agent for good within muscular tissues, while the rapidly interrupted Leyden-jar current of high potential and high frequency is sedative and corrective in still another way.

Supraorbital Neuralgia.—The first electrical procedure to try is the positive static spray, rather than the galvanic or high-tension induction-coil currents, because it is not only the most simple and often very effective application, but it involves also the constitutional benefit of general as well as local treatment.

Seat the patient upon the negatively insulated platform. Ground the positive pole and brass point electrode to the gas fixture. With the machine in moderate action apply a concentrated positive spray upon the site of pain until it is removed.

The point of the electrode should be held within a short distance from the surface—just beyond sparking distance—and kept in gentle motion over the affected area. The use of the hand electrode in these cases is preferable to a fixed electrode upon a standard, as it can be instantly and always under the control of the operator, regardless of any movement of the patient's head.

The delightful nature of this application will sometimes induce the patient to bend the head nearer the electrode, and use of a standard with the liability of a spark which is not wanted is imprudent.

Add to the local application a general nutritional *séance* of five minutes. To apply a static spray to the face or any part of the head without sometimes startling the patient by a vagrant spark will be found to require some manual dexterity and careful attention to the treatment.

If the general condition of the patient is such that positive electrification instead of negative is especially desired, the breeze must be applied in another way.

Connect the platform with the positive pole. Ground the negative pole to the water pipe. Do not employ the brass

point, but fix a fine wire spray electrode upon the standard so that it will present its multiple needle points in front of the supraorbital nerve, at a distance of two or three inches—the exact distance depending upon the rapidity of the machine and the vigor of the current.

Ground the standard to the gas fixture, instruct the patient to maintain the average distance from the electrode, but to turn the head gently from side to side so that the breeze will play like a refreshing zephyr across the forehead and upon the temples.

Start the machine into action very slowly, and cautiously increase the current until it is as strong as it can be made without risking a spark. The chin must be tilted up so that the breeze does not irritate through the hair. Its sedative effects depend upon its application to an uncovered skin. If the electrode is removed farther away—ten to twenty inches—it not only becomes diffused when it should be concentrated, but loses its soothing character and is exceedingly irritating. The secret of many good effects of the static breeze depends upon concentration of action, and when it is diffused, either by the size of the electrode or the distance at which it is manipulated, the sedative effect is lost.

Apply either form of breeze until the pain is entirely relieved, and for several minutes thereafter.

These two methods, one with negative and one with positive electrification, may be employed, and experience rather than printed directions will suggest the choice between them. If they do not afford a relief which gradually endures for a longer interval after each *séance*, with promise of becoming permanent, the case is not suited to this form of current. The static spray, however, in experienced hands will fail less frequently than many other much-praised remedies and we still have left the galvanic and coil currents and cataphoric medication among the untried resources of medical electricity.

Facial Neuralgia from Use of Hair Tonic Containing

Lead.—Seat the patient upon the static platform connected with the negative pole, ground the positive pole and brass point electrode to the gas fixture, start the machine into moderately rapid action, and hold the point persistently within a short distance from the seat of pain for from five to eight minutes, or not less than two minutes after all pain has ceased.

The spray should be so concentrated as to present the visible bluish discharge, but not contain any sparks at first, although as soon as the patient is accustomed to treatment I always let a few mild sparks pass to the muscles from the point of the electrode in addition to the spray. Repeat this treatment daily until relief lasts longer, and then as needed till entire recovery.

While at the beginning the hair tonic will of course be stopped, and potassium iodide administered internally to eliminate the lead, yet the static spray will not wait for the action of this remedy but will at once afford the patient a character of relief that is unspeakably grateful. I have even relieved such a case without any iodide at all.

Neuralgias in General.—For neuralgias in general, affecting the face, head, hands, feet, or any bony part to which sparks cannot be readily applied because of lack of muscle covering, the first choice of method is the positive spray, with the patient insulated negatively, and the positive pole and the brass point electrode grounded.

In concentrating a decided spray upon the seat of pain I always keep the electrode in gentle motion and near enough to establish a visible brush discharge which is my guide to the strength of the dose. For this reason I generally have the patient sit so that the part undergoing treatment is in the shadow.

When the static machine is operated with a motor the plates will almost instantly increase their speed, as the electrode attracts from the patient the accumulated charge, breaks down the insulation, and lessens the resistance against which the

machine works. For this reason the electrode must be managed with skill to regulate the proper strength of the application, and if the plates become too rapid the street current should be cut down to lessen their speed.

It is an important point to persist until pain is gone. In favorable cases this will occur in a very few moments, sometimes in a single minute, but I generally continue the spray for about double the time which elapsed before the pain ceased, or a total of from six to ten minutes.

Close the *séance* by devoting five minutes to general nutrition treatment adapted to the state of the patient.

Sittings should be repeated with reference to the severity and frequency of the paroxysms. My usual plan is to secure daily sittings if possible for at least the first week, and then adjust frequency to the needs of the case as they develop.

By the joint aid of static and galvanic currents the great majority of neuralgic pains can be satisfactorily relieved regardless of a differential diagnosis as to the cause, and with permanent results if the cause is also one which is amenable to their action.

In neuralgias affecting nerves below the neck, in regions covered with muscle, the static spark is probably more effective than any other treatment. It is not always so with pain in regions of bone and ligaments, for it is then disagreeable and less suited to the case. Deep visceral neuralgias also do much better with other currents than with ordinary static, although sometimes they do very well with sparks.

The great sphere of static electricity in the form of sparks is in parts covered with abundant muscle substance, in which contractions develop and increase the actions set up by their nutritional blows.

The anodyne effect of a single static treatment of a severe and chronic neuralgia will necessarily be short, as would also be the best effect of any single dose of medicine. Therefore sittings should in obstinate cases be made as often as pain de-

mands, unless some palliative that is not harmful can be satisfactorily employed between sittings which are farther apart.

In a great many cases circumstances and the financial or domestic affairs of the patient decide such matters rather than the exact therapeutic indications. Effectual cure, however, must be looked for in chronic cases along the lines of gradual nutritional improvement rather than from local and simply pain-relieving applications. Therefore every static sitting should aim at constitutional benefit, and the relief of any present pain is to be regarded as only a part of the patient's needs.

Sciatica.—Insulate the patient with the platform rod attached to the negative pole of the static machine. Ground the positive pole and electrode to the gas fixture.

If the case is acute, with considerable tenderness to pressure, use first the brass point electrode moved agreeably over the painful parts with two or three inches of spray gap. Keep the machine in moderate action. Gently soothe the entire limb and lumbo-sacral region in this manner for about ten minutes, and apply only a few mild and cautious sparks at the close of the first sitting.

If the case is subacute or chronic, a thorough course of percussive sparks judiciously regulated in strength according to the varying tolerance of the tissues between the ankle and the spine will be effective if properly given.

Begin with very mild sparks and posture the limb variously in every position and degree of muscular tension that can be discovered to aggravate the pain.

In every posture spark the painful point until the pain surrenders, and persist at each *séance* until relief is complete, and the patient steps actively about the room without any pain whatever.

If this degree of relief is obtainable and lasts for a longer and longer time after repeated sittings, the prognosis is favorable for one of the satisfactory cures which do so much to gratify suffering patients.

If absolute relief is not obtainable, either the skill of the physician is at fault or the case is less suited to static electricity. Rheumatism of the hip-joint must not be confounded with a sciatic neuritis or neuralgia in estimating the prognosis, nor, if the patient is a woman, should static sparks be expected to cure a case which should be referred to gynecological methods. My remarks here refer to ordinary sciatica of the form that it is usually expected medical measures will relieve.

Having obtained satisfactory relief from the first application of local sparks, apply sparks to the entire spine and other limb to promote nutrition and advance the improvement.

Repeat sittings daily until pain is absent for more than one day; then repeat every second day, and if the case is chronic continue treatment two or three times a week till improvement ceases. In all cases, either acute or old, several treatments should be administered after all symptoms have disappeared.

Medication for anæmia, malaria, syphilis, or any other associated state of disease which can be improved by appropriate remedies is always in order, but drugs directed especially to the sciatica will not be needed.

In the early stage of the treatment of a severe case, even if the patient is treated once a day, the relief from pain cannot be expected to last twenty-four hours after the sitting, and in private practice a temporary aid to comfort and sleep may be prescribed when the state of the patient demands it. To conquer the sciatica, however, I depend solely upon the static administrations.

From a comparison of my experience with the reports of some other physicians who state that they have been disappointed with the results of static sparks in sciatica, I am inclined to place a high value upon the postures I employ. I have repeatedly taken the electrode from the hands of another operator after the total failure of routine sparks to control the pain, and have relieved the patient satisfactorily in a few moments. Skilful posturing during the application of properly

regulated sparks is one of the chief secrets of quick results in all muscular pains which are made worse by movement.

If the case is not sciatica, but is an arthritis of the hip-joint, the spark is at a great disadvantage for reasons fully explained elsewhere, and although considerable improvement can be effected in hip-joint rheumatism by static electricity, the decisive results obtained in a neuritis or neuralgia of the sciatic nerve are not to be expected.

Almost every physician, however, who has a Holtz machine cures his cases of ordinary sciatica with static applications.

Case reported by Dr. F. A. Kraft.

Sciatica.—Mr. C. F——, a gentleman of 44 years of age, came under my treatment for sciatica of thirteen months' standing. Pain was very severe, especially in the sciatic notch, but less over the distribution of the nerve. In the afternoon it became more general and even affected the whole spinal region up to the shoulders, increasing in severity so that the gentleman was obliged to take an injection of one-fourth to one grain of morphine almost every day for nearly two months before calling at my office. He came for static electric treatment, determined to quit medical agents, and although I advised some glandular remedies to promote absorption, he emphatically declined to take any.

I started with the static applications of the breeze, first with the wood electrode, and particularly on the distribution of the sciatic nerve, the spinal cord, etc. After the second treatment the full spark with the brass ball electrode was applied and I finished every treatment with three to five minutes' head breeze.

The patient improved wonderfully, and particularly after the sixth treatment the progress of the cure was rapid and pleasing. The patient received eighteen treatments altogether, after which all symptoms subsided. This has been nine weeks previous to my writing these lines. The patient still runs up to the office for treatments though it is not necessary for him to do so, but he says once a week I want an electric head breeze which is the best shower-bath to clear the brain. Otherwise he is in the best of health.

One word more about static electricity and also one about "static machines." I have seen and tried different static machines and some with two, four, and six plates. The one I use

at the present time is an improved and larger machine, giving a much more powerful current.

Case reported by Dr. Franklin H. Clark.

Sciatica.—Mr. T. S——, aged 58, married, Italian, seven years ago was taken quite suddenly ill with sciatica.

Was treated at home for some time by a native physician of Rome, but did not improve. After three months of home treatment was taken to the hospital, and after two months of hospital treatment without any improvement was operated upon and the sciatic nerve thoroughly stretched. Slight improvement followed the operation for a short time only, and then the condition was just as bad as ever.

Three months after the first, a second operation similar to the first was followed by slight improvement for a short time, and then he was suffering as before.

Patient remained in the Roman hospital over four years, and was operated upon five times, and was treated by all known drugs for that disease, without any marked improvement. He was then sent to America, thinking this climate might do him some good, but he gradually got worse. Was obliged to move twice in this city, as the neighbors complained that he kept them awake at night by his moaning.

Two years ago he was brought to my office in an ambulance; left leg swollen to twice its natural size and exceedingly painful. Patient very pale and badly emaciated.

Applied static shocks with large Leyden jars for ten minutes, relieving pain very much, repeated this every day for one month. Patient could then walk one-half mile to my office. Applied the electricity every day or every second day, for nearly one year; discharged him cured.

He has been doing the heaviest kind of manual labor for the last year, without any return of the trouble.

Clinical Cases.—Mr. ——, aged 30, right leg attacked five months ago. First tried neighborly recommendations, then patent medicines, then druggist's prescriptions, and finally went to a physician. After an experience of five months he was wellnigh distressed with pain, and concluded to "try electricity." Called at my office August 18th, 1893, was suffering severely and was barely able to walk without crutches. The sole treatment given him was positive electrification with sparks for five to ten minutes. Result: The first treatment gave a complete relief from pain which lasted for half an hour, when pain returned as severely as before.

August 19th. Relief lasted about the same time. 21st. Relief from this treatment lasted a little longer. 22d. The fourth treatment gave relief from pain for about nine hours. 25th. Reports he is very much better. Can walk comfortably and stoops without pain. 26th. Feels nearly well. 29th. Has some pain yet at times, but thinks he is about three-quarters cured. 30th. Reports continued improvement. 31st. Had no pain for nearly the whole twenty-four hours just past, and sleeps restfully.

September 8th. Reports that he had had no pain since his last visit and has returned to his occupation. 11th. Last treatment. Reports entire relief.

Several months later a relative informed the author that he continued to be well.

Mr. ——, right limb affected, duration five months. Sensitive points: middle of thigh, popliteal space, calf of leg, behind external malleolus; pain constant, difficulty in getting up and down; knee jerk exaggerated; impaired nutrition; thin and worn-looking. April 27th to May 13th, 1892, seven treatments; improved nutrition; gain in weight; pain gone; free movement.

Mr. ——, clerk, four years. Onset sudden, worse in right leg; constant pain; worse before storms and in rainy weather. December 21st, 1891, to February 5th, 1892, seven treatments; recovered; able to stand at work all day. November 23d, 1892, presented himself for another trouble; no return of the sciatica.

Mr. D. D——, painter, six weeks. Painful points: sciatic notch, middle of thigh, and below head of fibula; leg held stiffly in walking and slightly flexed; extreme pain; worse on movement; was taking opium; twenty-one treatments; discharged recovered.

Mr. A. H——, clerk, nine months. Left at first affected, then right. Pain in sacrum, sciatic notch, popliteal space, and to foot; cannot sleep; knee jerk scarcely evokable in left leg. December 14th, 1891, to March 2d, 1892, thirteen treatments; pain remarkably relieved after five treatments; after six, able to sleep until 5 A.M., and go to work. After nine, at work all day, standing morning until night. Recovered.

B. M——, drives ice wagon, nine months; great pain; could not sleep; impaired nutrition; worn and anxious countenance;

impaired mobility; walked with great difficulty. October 9th to December 14th, twenty-eight treatments; no pain, walks well; improved nutrition; gain in weight; able to go to work.

Mr. S. B——, six months. Pain: sore on pressure at popliteal space; difficult locomotion and impaired mobility; walks with cane only. August 31st to November 6th, 1891, sixteen treatments; walks without cane; no pain or soreness.

Mr. S. S——, four and a half years. Onset sudden, back and left leg, then right leg; has been in hospitals and taking medicine and galvanism off and on ever since. Pain; cramps; shortening; walks only with cane; could not get on or off insulated platform without help. October 28th, 1891, to December 30th, 1892 (fourteen months), seventy-eight treatments; gets on and off platform without help; walks everywhere indoors without cane; no pain; no cramps.

Mr. M. P. B——, watchmaker; pain site of old sword wound, two inches to left of the third dorsal spine; pain constant, increased by motion and cold; "darting," "sticking" character; deep superficially burning sensation even to light touch of shirt. Four treatments and continued relief from pain to date.

A recent contributor to a medical journal remarks that "sciatica is a dire affliction which seems to tax the ingenuity of the average prescriber to such an extent that in the depth of his perplexity he calls for the observations and methods of others to aid him." An authority upon materia medica thus comes to his written aid. "Internally arsenic, iodide of potassium, aconite, cimicifuga, and turpentine offer the best means of relief in the treatment of sciatica. Externally massage, acupuncture, chloride-of-methyl spray, extension, actual cautery, blisters, and the application of precipitated sulphur to the whole limb sprinkled over flannel and covered with oiled silk. Injections of morphine, atropine, and sulphuric ether afford but temporary relief, and sometimes even aggravate the pain."

This list omits one very important remedy for sciatica, viz., static electricity. The administration of an anodyne is a very different matter from effecting a radical cure. The list of

medicinal remedies for sciatica is long, and by consulting various authors it may be increased indefinitely. But the prominence everywhere given in practice to hypodermic injections of morphine, or to the administration of some analgesic, is proof alone that there is no curative drug approaching electricity in value.

Cases have come before the writer with long histories of every possible form of treatment, some of them involving intense suffering in addition to the disease. They have come with scars on their bodies and profound discouragement in their minds (and occasionally resentment for the useless torture to which they have been subjected) and they have promptly begun to get well under static sparks.

To effect a cure we must undoubtedly act upon the nutrition of the central trophic cells and the substance within the sheath of the nerve itself, for some degree of structural change in some part of the nerve cell or its prolongation is probably present in all the manifestations of pain which we ordinarily call sciatica. Prominent authors contend that it is useless to speak of sciatica without an associated neuritis, which may be acute, subacute, or chronic. While the static spark may be theoretically contraindicated in some cases of sciatica, it is most usefully applied in practice by expert static electricians without regard to orthodox or popular theories.

The painful point and entire nerve course are subjected to a powerful static spark and they cease to ache, and the relief of pain for a brief time after the first treatment will gradually lengthen under repeated treatments until the relief is permanent.

No other plan of treatment known to the author will produce equally swift and certain results; and the cases of this affection which static electricity fails to cure, if it is administered by competent hands, will be found to be some other disease or pain dependent upon some cause, either incurable or removable by surgery alone. It is stated by a practitioner who has many

followers that in cases of sciatic neuritis "rest" is a most important agent. The so-called "rest cure" has therefore been in certain quarters a fashionable fad. After "eliminating rheumatism, gout, syphilis, injury, and pelvic growths, and deciding that the case is one of neuritis only," it is considered that—

The most certain indication is to secure rest, not simply by keeping the patient in bed, but by means of a long splint. An old-fashioned long splint from the axilla to the foot may be used, or a roughly moulded anterior splint with a wooden attachment carried up laterally to the waist or axilla.

The ankle must be sustained so that the heel does not carry the weight of the leg; the knee must be gently flexed and the angle of flexion changed a very little at each dressing.

After a few days of undisturbed rest all the joints must be carefully and slowly flexed and extended to a slight extent, to prevent too great stiffness, the common evil which follows the use of the splint. Only sufficient bandage to keep the splint in position should be used. If the patient cannot bear a long splint, an anterior suspension splint may be of some service.

By this simple [?] treatment "many cases of chronic sciatica may be overcome which have defied more elaborate treatments."

If the case be not cured by these means, the daily use of Paquelin's cautery button at the painful points is recommended. If still obstinate, employ dry *cold*. A rubber ice-bag is kept on the painful nerve day and night for two or three weeks, or the leg is placed in a tin or copper gutter on the under part of which is an ice case three to four inches wide.

As the pain diminishes, the use of cold is lessened until it is only applied at night or for an hour or two twice a day. If any pain points remain, the use of the cautery is often valuable, but is apt to interfere with massage treatment which is so helpful at this time.

Kneading of the muscular masses of the leg, and also a gradually deeper surface rubbing in a downward direction over the nerve trunk for half an hour twice a day, is now employed.

When the pain has disappeared, it is wiser for a while that at first the patient should stand aided by crutches and then walk with them, and not sit up long as this brings pressure on a nerve which may still be sensitive.

Often the patients are thin and anæmic, and general massage is of service after the "rest" treatment has been employed for some time; but at first it must be avoided in order that the resting limb may not be disturbed.

Strong galvanic currents may be of service in the milder forms

of sciatic neuritis, but this treatment is as painful and less efficient than the cautery.

If the wasted limbs do not gain in size and tone at the close of treatment, the stimulation of the induction current may aid in producing a more rapid result.

The treatment of chronic sciatica by splint, rest, and dry cold as above described is more apt than any other means to effect permanent cure, and it has many times triumphed when all else had failed.

The "simplicity" of this elaborate plan of treatment could scarcely commend itself to the physician accustomed to seating patients upon his static platform, applying sparks for five or ten minutes, three or more times a week, meanwhile allowing them to attend to their ordinary affairs and curing them usually in from ten to twenty treatments.

Neither could it be considered especially simple by the victim of sciatica who had to choose between its somewhat tedious if not exceedingly tiresome procedures, and the alternative of static sparks.

The method has been referred to here at an unusual length because the disease itself is of frequent occurrence and of sufficient importance to receive our fullest consideration; and because the method outlined affords a most remarkable contrast in every way to the treatment by static electricity.

To present this contrast clearly let us turn from our account of the rest cure to an ordinary case treated by static electricity. A physician reports:

Mr. M—— came to me suffering with sciatic rheumatism, worse on the right side, running down the limb. The pain at times was very severe, cutting like a knife, and greatly aggravated by motion.

Treatment: Negative electrification, five minutes. Breeze on spine, five minutes. Massage roller over lumbar region and down the right limb for eight or ten minutes.

His experience of the relief given during the treatment was constant; and a month's treatment cured him of his sciatica.

The author of the rest treatment states that he has never met with a case of sciatica in which he was obliged to resort to "nerve-stretching," and points out the fact that nerve-stretch-

ing is liable to fail, like all other means. In this last statement I fully concur, but cannot agree with the same writer on another point. In his allusion to "all other means" (except his own method), he omits static electricity, and for this agent the following advantages may be conservatively claimed and clinically demonstrated.

1st. It is applicable in practically all non-operative cases, and we are not obliged to "eliminate rheumatism, gout, syphilis, trauma, etc., and decide that the cause is solely neuritis."

The number of cases in which static will totally fail is very small. In most cases it will produce at least some immediate benefit. In the majority of cases it will produce curative results if fairly tested, and in recent cases often acts like magic. It would require considerable proof to convince me that any single agent surpasses it in the treatment of sciatica.

2d. The patient is not inconvenienced by forcible detention in bed.

3d. The application of splints, dry cold, bandaging, flexion, extension, kneading, dressing the limb, etc., which evidently require a skilled attendant and a great deal of time, not to speak of the tax upon the patient, are entirely done away with in static treatment.

4th. Long and enforced rest impairs the muscles in tone and function; sparks give firmness, activity, and strength to the entire limb thus treated. No muscles can waste away under static sparks.

5th. Relief is manifestly more prompt. In fact the patient steps from the platform free from all pain at the end of the first and each succeeding treatment, and this relief in time is usually permanent.

6th. If a cure is effected it is done in much less time.

7th. If static fails, its failure will be quickly demonstrated so that little valuable time is lost and other measures may be tried, while all medicinal indications may be fulfilled from the very commencement.

8th. If the patients are "thin, anæmic, rheumatic, paralytic," etc., the static treatment is directly beneficial to these existing conditions. Scarcely any better could be devised.

9th. No "painful cautery buttons," or other "painful" auxiliary aids are required.

10th. When the pain has disappeared the patient is not weakened and wasted by long inaction so as to require "massage, faradism, and tonics to build him up, and crutches to assist in standing and walking," but under static sparks he has been gaining strength, and muscular activity and endurance, hand-in-hand with the disappearance of the pain.

To the author of this work these seem advantages that would have peculiar weight with the patient as well as with the general practitioner, although it is readily surmised that with the resources of a sanatorium to admininister the details of the rest cure, the longer method would possess an undoubted financial attractiveness.

Traumatic Neuritis, and Recent or Chronic Effects of Cold and Damp.—Seat the patient upon the static platform, insulated negatively. Test the tolerance of the part affected with a gentle local application of the mild positive spark. If the spark is not tolerated in an acute condition, a positive spray may be applied for the relief of pain until improvement permits a spark. Cases, however, rarely come to the office in a state into which some intensity of spark cannot be applied by at least the second treatment, with positive and progressive benefit thereafter.

In all chronic cases the spark is certainly *facile princeps*. Use it with judgment and care equally to avoid "too little" and "too much," and no other form of treatment will be required for ordinary cases. Repeat as often as needed for relief of pain and acute symptoms, and continue later treatment three times a week.

Some of the most interesting effects of static electricity are observed in the treatment of neuritis and associated pains.

When a so-called neuralgia is caused by an inflammatory exudation somewhere in the nerve sheath—an exudation which must be absorbed to obtain relief—then static sparks are certainly the sovereign remedy. Not only are galvanic and faradic currents more troublesome to apply, as they require the removal of clothing, but their curative effects in these cases are decidedly inferior to the powerful, deep-acting, anti-congestive, anodyne, and nutritional spark.

If inflammation has proceeded to destruction of nerve tissue, with wasting and degeneration of muscles, the treatment should be supplemented by the use of a slowly interrupted Leyden-jar current in the same manner that the faradic current is employed in other atrophic and paralytic states.

CHAPTER XVII.

NEURASTHENIAS.

Simple and symptomatic. Acute or chronic. Static electricity the sheet anchor of treatment. Operative methods. The treatment of local symptoms in neurasthenic cases. Constitutional benefits of general electrification in neurasthenia. Differential indications. Frequency of treatment. Auxiliary medication. Prognosis. Facility of static methods. Principles governing current action in neurasthenia. Clinical remarks. Beard's symptoms.

THE successful treatment of neurasthenia requires the co-operation of the patient with the physician. The sheet-anchor of nerve-renewing force is electricity. Rest must economize and accumulate its benefits, and in some cases appropriate drugs must assist at the start, but the chief part of the work can be done with static electricity. Neurasthenic states, nervous break-downs from mental or physical overtax or insomnia, with either local or general manifestations, present a great many difficulties to symptomatic drug treatment.

Treatment.—In the beginning treatment must often be modified greatly, to initiate the patient rather than to attack the disease. The simple electrification and breeze methods are first to be employed, and if sparks are regarded as desirable they can wait till the patient is ready.

Seat the patient in a comfortable and high-backed chair upon the static platform and in the most restful position for complete nerve composure. The first tentative electrification should be negative and mild if the patient is a stranger and full of unfounded fears.

Attach the negative pole to the platform, ground the positive pole, start the machine into slow action, observe the tension of the hair and the increase of the patient's confidence, and follow this up with gradual increases of the current strength.

In about ten or fifteen minutes close the first sitting. Attempt nothing else. Do not touch an electrode or go near the patient while she is insulated. Let her reassure herself and get some benefit before the next step in advance is undertaken.

Upon the second visit, or at the first, if no particular caution seems necessary, make the electrification positive, but see to it that nothing in the room near the platform exerts an attracting influence to disturb the patient's composure.

Until the patient is prepared by established confidence to let the operator employ electrodes, no local application should be attempted. It is necessary to speak of this because a neurotic patient may occasionally be lost by too much vigor during the first sitting. Personally, I am in the habit of commanding full confidence at the second visit and usually at the first, even with patients never seen before, but only the mastery of practical experience will enable the physician to do this, and it is better to go slow rather than to hasten too fast.

The duration of each *séance* of positive electrification is governed by observing the effects. When the patient perspires freely it is a sign that the stopping-point for the day is reached, provided the diaphoresis is not due to the warmth of the room and the retention of heavy wraps during treatment.

In all cases there may wisely be a gradual advance from short to long sittings, but in saying this it must be noted that the expert can often produce effects in ten minutes that a novice would waste half an hour in securing. Nevertheless a half-hour of restful and restorative simple positive electrification is sometimes the best treatment that can be given.

The next step in procuring a general tonic and active nutritional influence is by the author's method of potential alternation. Begin the *séance* by positive electrification as usual, adjust the brass ball electrode upon the standard and administer the vibratory current, regulated in spark length to a comfortable intensity, for ten minutes longer; then close the sitting with any local applications that are required.

By this time, in the majority of cases, the gain in nerve composure, sleep, well-being, appetite, and spirits is manifest. The patients now eagerly crave the static bath and spontaneously look to it as the means of restored health. Its benefit is self-convincing and no assurance that it will do further good is needed; the stanchest advocates of static electricity are the patients themselves.

We are now ready to attack local symptoms with the brass point breeze electrode. Do not begin with sparks unless you know your patient, know the spark action, and have confidence in your skill; for sparks are somewhat energetic in irritable nerve states, and they should be known to be necessary before they are used.

The first attempt of the breeze should be made with negative electrification. Stop the machine, remove rod from positive pole, transfer it to the negative, and ground the positive pole and breeze electrode. I pay no strict regard to whether the neurasthenia is cerebral, spinal, sexual, or to any other limiting diagnostic phrase. I consider the patient "sick all over" and treat her or him accordingly with the most thorough constitutional administration possible. Upon this general benefit I engraft such local benefit as symptoms call for. This is practical medicine as opposed to text-book theory.

To culminate the constitutional benefits of general elecrification I close the sitting or begin it, either one, with the most complete sedative, or sedative-tonic, or stimulating-tonic, or even counter-irritant effects I can produce with the point electrode, with either positive breeze or spray, or negative breeze or spray, or rubbing frictions, as these in turn are indicated and as the case is ready to receive the application.

During the use of this electrode it requires but a little time to concentrate upon an aching, congested, irritable, or painful point of the spine, head, pelvic region, perineum, muscle group, hands, arms, legs or feet, the localized effect that the condition calls for.

Upon the vertex, forehead, or the base of brain, headaches or congestions in these regions take more time to relieve by sedation than is required to stimulate nutrition in other local parts, and I therefore usually complete the application by a positive breeze from a fixed electrode directed toward the one of these situations which causes the complaint.

When a quick cutaneous and reflex stimulation can be beneficially applied to either the local part of an aching spine or to all the muscular surface of the back and extremities, this can be done by friction sparks in two or three minutes or less without removing a garment. The effect differs markedly in sensation from general faradization but in lasting results it is not less efficient and takes about one-fifteenth of the time and trouble.

This counter-irritant and stimulating effect is produced by a very quick rubbing of the large brass ball electrode over the surface of the clothing in close contact with the patient. With negative electrification it is less sharp and hot than with the positive high-potential charge, but in either case the novice should try it on himself and learn how to consult comfort before he rashly ventures to treat a patient with this profoundly revulsive and intense application.

When improvement has proceeded so that the strengthening of muscles can be begun by the use of sparks, or their deep-acting effects applied for other needs, they should always be mild positive sparks given at the latter part of the *séance* and increased in vigor with some prudence.

All these needs for caution cease to a great extent as soon as improvement is well under way. The patient will gladly welcome treatment as soon as she discovers its benefit, and the timidity of the period of strangeness vanishes forever.

In clinical experience I find that patients who attend three times a week, receive no medical aid, and who return to their ordinary household duties, derive great benefit from static electricity alone; but they do not get rapidly and permanently well

in chronic cases, especially if they come a fatiguing journey to reach the office and repeat it going home. They spend strength at home as fast as they made it during treatment, and about all that can be done is to keep them able to do more work than they did before. In even these cases, however, static electricity does what medicine, as usually prescribed, fails in doing.

In private practice, with appropriate medication, daily treatments, and auxiliary rest, the results are far more satisfactory. In acute states the recovery is quickly brought about. When relapses occur from imprudence the gain goes on again at the next sitting; when fresh symptoms develop they may each be relieved during the sitting without special prescribing, and it is this fact which constitutes one of the most gratifying features of the treatment of neurasthenias by static electricity. As soon as sleep improves through the aid of breeze and spray upon the upper spine and head, the whole system marches forward to a general improvement, for there is no restorer like refreshing sleep. The great nerve centres to which the physician is accustomed to address himself in central galvanization are equally important under static methods and the principles of affecting them are precisely the same.

Clinical Remarks.—From the fact that no removal of clothing is required and the patient derives an immediate benefit at every *séance*, static is preferable in practice to other forms of electricity in the treatment of neurasthenic patients.

The aim of intelligent treatment of neurasthenia with static currents is to make a sustaining, tonic impression upon the whole system. The methods involve general positive electrification and localized nutritional, alterative, function-regulating impressions upon the cranial and spinal centres and sympathetic system, and the motor-nerve supply of muscles, by the local concentration of current action upon the head, spine, and general surface of the body through the medium of the breeze and spark electrodes.

In these cases, as in all others, the physician must know his

electro-therapeutic target and how to aim at its centre. It will not do simply to apply in a mechanical manner "as directed" a breeze or spark or any other form of electrical energy.

It is essential to determine what effects are required, know how to produce these effects, and proceed with definite and positively applied methods to "round up" the errant nerve forces and reform their shattered ranks. They must be coerced into line and drilled again into effective action, and no perfunctory requests on the part of the operator will ever equal in result the effect of sharp and decisive commands. If anything is to be expected of static electricity in cases that have perhaps already gone the rounds of the neighborhood profession without relief, the operator must produce his results as Turner mixed his colors: "with brains, sir!"—for the Holtz machine will do little for a patient automatically.

It is necessary to say this plainly because an opinion prevails in some quarters that any electric current can be injected into the body in any sort of way, and either cure disease by accident like magic, or in other cases prove to be no good at all. Static electricity, within its legitimate sphere of action (see chapter on its physiology) will do what the skill of the operator makes it do, and seldom any more.

It is usually necessary to call a halt to further waste of nervous substance, aid the elimination of toxic products of fatigue and incomplete metabolism, and establish and maintain the highest possible nutritive activity.

To accomplish these things brief and infrequent treatment is disappointing. The nutritional and nerve-refreshing banquets of electrical energy must be fed to the nerve centres and the asthenic tissues to the extent of a "saturated solution" at each meal; and repeated often enough to maintain each nutritive gain, add to it, and put benefit upon benefit, on the same principle that food nourishment is forced in cases of emaciation.

It is certain that when the intervals between electrical doses are so long that the first benefit overpasses its maximum and

dies completely away before the second is administered, that the patient will stay very near the starting-point and make but slow advances toward the distant goal of health.

The state of nervous prostration may be due either to swift or gradual exhaustion, worry, starvation, or toxæmia of the nerve centres, but, however caused, I believe that the joint use of galvanic and static methods, together with sensible hygiene and accessory medication, constitutes the best-known treatment of neurasthenic patients.

The rest cure and massage are popular methods of treatment for neurasthenia, but the patient is indeed unfortunate who misses static electricity. Properly managed it is from fifty to five hundred per cent more satisfactory than routine treatment without it.

Neurasthenia has been said to constitute "a whole family of functional disorders." It is also said to be "at once the most frequent, most interesting, and most neglected disease of modern times." It may also be stated that static electricity, with the help of reasonable medication if not quite single-handed, will cure every curable case, provided the patient will submit to regular and systematic treatment.

The study of "nervous prostration" or "nervous exhaustion," "nervous debility," "weakness," "nervous dyspepsia," or neurasthenia under any of its many names is essentially a study of symptoms which are of the nature of functional derangements.

The characteristic effects of static electricity in the regulation of perverted functions are well known to all who employ it. The late George M. Beard presented a comprehensive list of the symptoms of neurasthenia in his work upon the subject of nervous exhaustion. It is impossible to peruse this familiar list without a profound appreciation of the single remedy which will conquer almost every one of Beard's hundred and fifty symptoms and give comfort to the afflicted patient.

No detailed instruction for the treatment of each symptom of neurasthenia can be required by the physician who studies

this book as a whole, for the general principles of treatment are carefully laid down. It is eminently suggestive, however, to group before the eye these collected symptoms of "the most frequent of modern diseases" so that we may know exactly what the static machine is capable of doing for its relief.

This remarkable list is as follows:

Symptoms of Nervous Exhaustion (Beard).—Tenderness of the scalp; cerebral irritation; dilated pupils; sick headache and various forms of head pain; pain, pressure, and heaviness in the head.

Changes in the expression of the eye; congestion of the conjunctiva; disturbances of the nerves of special sense; neurasthenic asthenopia; muscæ volitantes.

Noises in the ears; atonic voice; deficient mental control; mental irritability; hopelessness; morbid fears; astraphobia, or fear of lightning; topophobia, or fear of places; agoraphobia, or fear of open places; claustrophobia, or fear of closed places; anthropophobia, or fear of society; monophobia, or fear of being alone; phobophobia, or fear of fears; mysophobia, or fear of contamination; pantaphobia, or fear of everything.

Flushing and fidgetiness; frequent blushing; sleeplessness; bad dreams; insomnia; drowsiness; tenderness of the teeth and gums; nervous dyspepsia (dyspepsia asthénique); deficient thirst and capacity of assimilating fluids; desire for stimulants and narcotics.

Dryness of the skin; abnormalities of the secretions; abnormal dryness of the skin, joints, and mucous membranes; sweating hands and feet with redness (palmar hyperidrosis); salivation; tenderness of the spine (spinal irritation) and of the whole body (general hyperidrosis); coccyodynia; peculiarities of pain in the back.

Heaviness of the loin and limbs; shooting pains simulating those of ataxy; podalgia (pain in the feet); tremulous or variable pulse and palpitation of the heart (irritable heart); local spasms of muscles (tremors).

Dysphagia (difficulty in swallowing); convulsive movements, especially on going to sleep; cramps; sensitiveness to weather; sensitiveness to cold or hot water; sensitiveness to changes in the weather.

Localized peripheral numbness and hyperæsthesia; a feeling of profound exhaustion unaccompanied by positive pain; ticklishness; vague pains and flying neuralgias.

General or local itching (pruritus); general and local chills and flashes of heat; cold feet and hands; nervous chills; sudden giving way of general or special functions; temporary paralysis; diseases of men (involuntary emissions, partial or complete impotence, irritability of the prostatic urethra); diseases of women. Oxalates, urates, phosphates, and spermatozoa in the urine. Gaping and yawning; rapid decay and irregularities of the teeth.

CHAPTER XVIII.

CHRONIC FUNCTIONAL NERVOUS DISEASES.

Principles of treatment with static electricity. Frequency of sittings. Temporary functional nervous derangements. Methods of treatment. Acute chorea of children. Clinical methods of treatment. Results. Limited chorea of a part. Treatment. Chronic chorea in adults. The value of static electricity in treatment of the patient. Indications defined. A clinical case illustrating each leading type. A consideration of different static methods. The static cage in chorea. The static breeze in chorea. Sedative-tonic general electrification. Mild sparks. Auxiliary medication.

The general principle of "treating the patient rather than the disease" should be followed in these cases, and efforts are to be made in the direction of "aiding nature to restore the sound state."

Depend upon general positive electrification for its sedative-tonic effect; upon the breeze, spray, and mild spark to relieve local symptoms, especially pains, aches, and muscular debility; and adjust the methods employed to the individual needs of the patient.

No rule can be laid down in advance. Daily repetitions are always advisable at first if they can be arranged. It is fatal to good results to allow too long an interval between treatments, for the benefit of the first will then be often entirely dissipated before the second is given.

It is the aim in all static electro-therapeutics to accumulate benefit upon benefit instead of wasting repeated sittings by delays between them.

Temporary Functional Nervous Derangements.—Many of these will obtain speedy relief from some form of static application adapted to the symptomatic manifestations, without reference to the apparent cause. The basis of treatment in

this class of cases is the function-regulating, sedative-tonic action of positive polar general electrification, upon which must be engrafted such local uses of the breeze, spray, or spark as may be required to meet the indications.

In all these cases we must treat the general health of the patient, and it is impossible to direct special methods in advance of seeing the case. References to diseased conditions by the terms of classical nosology are not very helpful. If the operator is informed as to the effects his different methods will produce and knows how to administer them with judicious dose-regulation, he will be fully prepared with static electricity to meet and relieve a great many manifestations of the functional neuroses.

Acute Chorea of Children.—Static electricity treats the patient by way of aiding nature to restore the nervous equilibrium.

Administer simple positive electrification for fifteen minutes at first. As soon as the child is free from alarm and will accept all the operator wishes to do, shorten the general treatment by one-half and devote the second part of the sitting to a concentrated positive breeze over the entire head and spine, with particular impression upon the centres of the medulla and cerebellum.

To this may be added shortly, and later substituted for it, an application of mild positive sparks to the cervical and lumbar spine—and ovarian region in front if the patient is a girl. Do not agitate the already overactive muscles by sparking the arms.

Repeat daily until the nervous system remains tranquillized for a longer interval, and then every second or third day as may be indicated.

The average results of medical treatment of chorea will be made more certain, more quickly attained by probably one-half, with an early and immense relief to the patient's nerve tension, and decided improvement in general health, when static elec-

tricity is employed in conjunction with the use of indicated mild remedies.

It is efficient in some cases alone, and when rheumatism complicates the chorea it is more than ever indicated, and should be employed in every case with an intelligent adaptation of the method to the state of the patient.

If there is marked brain disturbance the best primary application is negative electrification with positive head breeze. The habit of pushing Fowler's solution of arsenic to the border line of poisoning the patient for the sake of combating chorea is an extremely poor one from the standpoint of rational therapeutics, and is left without excuse when the resources of static electricity are employed.

In the very small proportion of cases in which it fails to make a decided impression upon the spasmodic symptom, its influence for good upon the nutritive processes, pelvic functions, and upon the cerebro-spinal nervous system in general indicates its aid as one of the best and most grateful helps the patient can receive.

That there are some causes at work in the production of exceptional cases of chorea which render them practically incurable is self-evident, and it is not necessary to explain that electricity will not cure all cases of chorea.

In persistent, localized chorea of a limited part, the nervous state is usually so below par that static electricity may well be employed even if no hopeful prognosis for relief of the chorea can be given.

It will improve the strength, composure, confidence, and spirits of the child, and in this way, if in no other, will be beneficial to the extent of perhaps one-half the value of a radical cure.

In partial choreic affections from chronic spinal disease the spasmodic movements cannot be made normal, but the patient can nevertheless be given so much comfort and relief from various symptoms—pain, irritability, morbid mental states, etc.

—together with added strength to the arm or part affected, as to express decided satisfaction even when the physician will note that the so-called chorea is nearly as bad as ever. It may be, but the patient is better, and is often inexpressibly grateful to static electricity for the measure of relief afforded by it.

Chronic Chorea in Adults.—Static electricity is by no means without practical value in cases of chronic and incurable chorea in adults, nor is it difficult to say in advance what benefits the patient may expect.

The indications for various forms of electricity are by no means mere guesswork, but are accurately outlined in the ascertained facts of electro-physiology, and quickly attain even more accuracy than do the indications for most drugs under the instruction of educated experience.

If the patient is muscular, strong, well nourished, with good appetite and digestion, and practically without symptomatic disturbances except the spasmodic movements, do not expect any material benefit from static electricity. I do not undertake such a case except at the patient's urgent request, and with the understanding that the treatment is purely experimental and little or no results are to be expected. This class of cases is in the minority.

If the patient is at the antipodes of the electro-positive state of general health, is negative, anæmic, neurasthenic, the whole muscular and nervous system debilitated, with broken sleep, headaches, spinal and muscular pains, and other symptoms which are much more frequently met in these cases than otherwise, static electricity will do good in direct proportion to the degree of the negative state. For a full explanation of the *rationale* of the effects of static electricity in benefiting these patients, the reader who has been referring them to chance is referred to the chapter in this book upon the physiological action of static currents.

On September 9th, 1893, I reported the following case which exemplifies the above remarks:

Miss ——, chronic chorea of forty-four years' duration. This interesting case had its origin in a fright when the patient was six years of age. She is now 50, single. Weight, 105 pounds; extremely nervous, head and right arm affected; head would play a tattoo on the pillow half the night before she could compose it for sleep. Arm nearly powerless. No appetite, dreaded the observation of strangers, and lived a secluded life. Had constant pains in occipital, cervical, and lumbar regions.

After one month, during which she had only ten treatments, she reports: "Owing to illness in the household, I have had to assume duties much beyond my strength, so that I have been unable to do justice to my own health. I have, however, gained three pounds, sleep composedly, am hungry for every meal, go out alone freely, do not mind the gaze of strangers, am less nervous, can use my arm for many little services, can stoop and pick up an object from the floor, a thing I never did, in my recollection, until now.

"I have had no pain in my head and back since the second week of treatment, and the constant sense of nerve strain which I formerly had is entirely gone, so that I have more comfortable rest than at any previous period of my life."

During the three and a half years which have since elapsed I have kept track of this case. She has been under an unremitting strain of domestic cares, and has been and still is in great need of much further treatment. Once in a while she has come to me for quick relief from some temporary symptom which she has learned from experience that a single static administration will abolish, but she is not so circumstanced that she is able to attend to her own health in a proper manner. She, however, has stated to me over and over again that she has never lost the original improvement, that but for the benefits derived from the static applications she could not have endured the subsequent tax upon her, that the distressing pain in the cervical spine from which she suffered for many years has never returned except for brief intervals when she was extremely fatigued, and she often expresses her gratitude for her general increase of comfort and strength.

Another phase of chorea in its chronic and practically incurable form is illustrated in the case of J. D.:

J. D——, October 5th, 1896, aged 35, porter by occupation. Chorea began in early childhood following scarlet fever, affects both upper extremities and head. Is a hardy, muscular man of medium weight, and when sitting with his hands grasped together, controls the movements to rest his arms by pressing them between his knees.

Owing to the fact that practically no improvement in his nutrition, digestion, sleep, and muscular strength was needed, and that he had no pain or other symptoms except the spasmodic movements of the head and arms, he was told that his condition was not favorable for treatment. He, however, expressed an earnest wish to "try electricity," and he was accordingly given eight administrations between October 5th and October 23d. No change in the state of the chorea took place, and although the patient desired to continue the treatment for at least three months in order, as he said, to thoroughly satisfy himself, I considered the indications very clear and declined further treatment.

In choreic movements associated with spastic paralysis of an arm, with atrophy and tonic contraction of the hand and wrist muscles, the prognosis from electrical treatment can only refer to improving the general health and local nutrition and strength. The chief symptoms will remain about the same except so far as they are ameliorated by the processes of nature. The treatment of such a case was begun September 9th, 1896.

E. R——, aged 14½, right foot, leg, hand, and arm affected, also neck and head in a less degree; the muscles of speech are affected, but he can talk so as to be understood. Duration of disease, four years. The boy was anæmic, exceedingly nervous, and startled by almost everything going on around him. He was fairly strong and of fair size for his years. He was regarded as incurable, and his mother who brought him for treatment was so informed; but as she expressed a wish to do everything that could possibly be done for her child and leave nothing untried that might be of benefit, treatment was undertaken with no promise as to the results.

Between September 16th and December 4th he received thirty-two applications by various methods as they were in turn indicated.

At the third visit he reported that he felt improved, less nervous, slept better, was not frightened so easily, and that he had

picked up a lead pencil from the floor with his paralyzed hand, which he had previously not been able to do.

While an observer could detect no anatomical change in the condition of the wasted and spastic muscles or the contracture of the knee-joint, yet the boy persistently stated that the treatment was doing him good, and his mother said that he was so eager to come that nothing would induce him to miss a single treatment. He had, however, an acute attack of tonsillitis and did not attend for two weeks.

On November 16th and 23d entries were made in my case record as follows: "Has grown steadily stronger, is less nervous, has a good, hearty color, and although arm and leg are but slightly improved, his general state of health is remarkably improved; he has grown into a stout, rugged boy, and feels greatly benefited."

The manner in which this boy began to grow and change in spirits while he was treated with static electricity excited frequent comment among physicians and others who observed the case.

Case reported by Dr. F. A. Kraft:

Chorea.—A girl, 13 years of age, presented herself at the office with a very marked case of chorea; her speech was an incoherent mumble. I examined her closely, but did not find any cause that could have produced her condition. Gave remedies like arsenic, gelsemium, etc., but with no results. The second week I applied the static current, particularly upon the spinal region. An astonishing effect was also derived from the static head breeze, which seemed to have a direct antidoting effect against the disease. Immediately after the treatment a desire for sleep manifested itself, and after having enjoyed this blessing of nature for a few hours the patient awoke refreshed. After eleven treatments she was discharged.

Her older sister had chorea two years ago and was treated for twelve months by other methods.

Chorea has been successfully treated by different physicians by different methods of employing static electricity. Bishop has employed the static cage with much satisfaction and cites the following case:

A young lady who was sent home from a seminary in consequence of a severe chorea minor, complicating chlorosis. She

was placed in the static cage and given the shower bath ten minutes.

During this time she was made to inhale deeply and regularly the electrified atmosphere which surrounded her. The poles were then approximated and the oscillating current, as strong as she could comfortably stand, was given for ten minutes. At the end of the treatment she would invariably come out of the cage with rosy cheeks. At the end of three weeks her menstrual function was re-established, the chorea was gone, the chlorosis had disappeared, and she went away feeling well and happy. This case was treated daily.

The static cage, as described by me elsewhere, is simply an expansion of the static breeze, and Brower reports his experience with the ordinary form of breeze in the following language:

The patient is placed upon the insulating platform connected with the positive pole. The head-breeze electrode is connected with the opposite pole. The total treatment consists of ten minutes' simple positive electrification with five minutes' head breeze, after which the patient rests in the reception-room for about ten minutes. Treatments are repeated if possible every day for the first week, then three times for the second week, and two treatments thereafter until the case is relieved.

All of the eighty-eight treated (by Brower) were also placed under the best possible hygienic conditions. Eighty-three of the cases had a duration of disease averaging from twelve to eighteen weeks and had resisted the treatment of the family physician, and were subjected to static electricity because the physician, or parents, or both were discouraged with the effects of other remedies.

When necessary school was stopped, an hour of rest required in a darkened room at midday, the diet carefully regulated, and elimination by the bowels, skin, and kidneys maintained at a proper standard.

Arsenic in some form and in varying doses was administered to all. In the most rebellious cases it was pushed to the limit. Blaud's pills were given in anæmia. If the patient was a female and puberty was delayed, cimicifuga was administered for its tonic properties on the uterus. If the patient had a rheumatic history, sodium salicylate, or more recently salophen, was made a part of the treatment.

If the sleep was insufficient, bromide of sodium, with or without chloral, was administered at bed-time.

Fifty-three of the cases were females, thirty-five males. Ages ranged from six years to thirty years.

Five of the cases only were acute and had continued less than one month.

The immediate effect of the treatment on these patients was often magical. Just as soon as they became completely charged on the platform, the violent contortions would stop and the patients remain quiet as long as the treatment was continued.

Forty-five per cent of all the cases treated were relieved in about six weeks. The more chronic the case the longer the treatment was necessary. I have just completed the successful treatment of a case in which the disease had continued uninfluenced by all other treatment for two years. The static treatment was five and one-half months.

It is, however, superfluous to attempt to add much to the classical reports upon the treatment of chorea by static electricity which are contained in the latter part of this book. Every physician should study them in detail and profit by the sound remarks which accompany them. The modern machine supplies something of the deficiencies which surrounded the methods employed half a century ago, and we now expect not only better results but very much greater help in improving the constitutional state of the patient than was possible when Leyden-jar discharges were the chief means employed.

CHAPTER XIX.

STATIC ELECTRICITY IN HYSTERIA.

Its action as a function regulator. Its influence upon the sympathetic nervous system. Three indications for static electricity in hysteria. The management of hysterical patients during treatment. Operative methods. Spinal irritation and hysterical spine. Static methods of treatment. Clinical remarks and clinical precautions.

THE treatment of protean hysteria will enlist the full resources of the physician, but if electricity is employed symptomatic medication can many times be set aside. Hygiene and mental therapeutics may be utilized as far as they will go, but electricity should be added to them, and it constitutes a sheet-anchor among curative measures.

The ordinary and most frequently advised, yet most troublesome and least effective method of electrical treatment consists in "central galvanization and general faradization on alternate days, with local faradic exercise of any paralyzed muscles. If improvement progresses in a short time the *séances* may be reduced to three times a week. In some cases a course of two weeks' treatment will reinforce the nerve centres for six months or more before a relapse occurs. Then treat again."

In patients confined to the house for any reason, the electrical applications can of course be made only with portable batteries; but for persons that can or will come to the office, the static machine surpasses in value all other resources of therapeutics. There is no doubt of this.

Hysteria is a functional disease of the nervous system, characterized by a morbid susceptibility to mental emotions without will-power sufficient to control them. It also involves sympathetic nervous phenomena. There is frequently some un-

doubted relation between hysteria and uterine and ovarian disturbances. Violent mental phenomena arising from grief, disappointment, anger, fright, suspense, etc., are also among factors of causation.

These familiar facts in regard to hysteria are known to everybody, and the physician who will turn from them to a careful examination of the actions of different administrations of static electricity upon the nervous, circulatory, and muscular systems will find that it is a remedy which fits the disease as completely as mercury fits syphilis or quinine malaria.

Some of the directions for the management, control, and treatment of hysterical patients perpetuated in general works on medicine are unnecessary and unkind, and if literally followed would not be calculated to maintain further cordial relations between the physician and patient. Valerian and asafœtida are also ill-smelling stuffs to have in the house, and alcohol and opium, chloral, sulphonal, chloroform, etc., lead the patient down hill instead of up. Removal of innocent ovaries has time and again proved to be a vain procedure, and hysterical patients in general form a class who seem to have few rights that medical authors feel bound to respect. A cold bath administered in hospital cases is sometimes disastrous.

There are three indications for static electricity: (1) The improvement of the patient's general health; (2) the relief of symptoms; (3) a more or less permanent cure.

The management of an hysterical man or woman upon the platform of a powerful and well-handled static machine cannot be set forth in book form, and the secret of satisfactory results lies in a tactful controlling management of the patient rather than in set rules of treating the disease.

The static machine reduces the successful treatment of hysteria to practical lines, and no kaleidoscopic changes of symptoms in these cases can ever embarrass the therapeutist for a remedy, nor elude the searching out of some conquering breeze, spray, or spark from this versatile master of neurotics.

In genuine cases of hysteria with paralysis, aphonia, ovarian pains, backaches, joint pains, curious sensations, and all the vagaries which this neurosis may present, static electricity is the sheet-anchor.

The basis of treatment is a most thorough constitutional application of positive charge for eight or ten minutes, or potential alternation in suitable cases, together with head and spine localizations of the positive breeze or spray; and later when required positive sparks to the spine, affected muscle groups, painful nerves, hysterical joints, the lumbar and ovarian region in women, and the lumbar centres and perineum in men.

Some of these patients complain of one form of application while they welcome another, and their feelings should be regarded; but as they sleep better, grow brighter in spirits, experience less irritability, and yield to the gradual influence of the sedative-tonic static current, they usually become eager for it and are convinced of the benefit it imparts. If a patient's mind occasionally takes the opposite view, the treatment should not be urged.

Spinal Irritation and Hysterical Spine.—Seat the patient comfortably upon the static platform with the positive pole connected to it. Ground the negative pole and administer simple sedative electrification for about ten minutes. Then ground the brass point electrode and administer a soothing agreeable breeze up and down the spine and upon the head by long sweeps of the electrode.

At tender spinal points concentrate the breeze into a warming and anodyne spray, and, if it is possible to cause any aggravation by movement or posture, have the patient do so and persist till the pain is gone.

As soon as confidence is established, encourage the patient to accept mild sparks over the spine and lower extremities, and also the ovarian region if symptoms indicate. Repeat daily if possible, and a few sittings will usually complete the relief.

Clinical Remarks.—Static electricity especially commends

itself to hysterical patients, both by reason of its beneficial effects and the facility of its administration without removal of clothing. Some tact is, however, required in the management of electrodes for local applications until the confidence of the patient is established by the benefit obtained. A patient in an extremely unsettled state will often regain a degree of composure after ten minutes on the platform which she would not have believed possible before she experienced it.

It is at the first visit and during the first treatment that caution is required, for if a patient is pleased and benefited the treatment will go on agreeably, while if careless or rudely performed applications are abruptly made, the second visit may never come.

A word of assurance to the patient and a gentle manner is always advisable. The very gradual approach of an electrode which the patient sees for the first time is very much more judicious than the startling effect of a sudden spray or spark, which the patient does not understand and for which she is not prepared.

Managed in a sensible way a preliminary sedative electrification will prepare the nervous system for a local breeze, the breeze will pave the way to the stronger spray, and the spray will prepare the tissues for mild sparks. When mild sparks are applied with comfort to the patient there is no further difficulty in increasing their vigor if there is any temporary need at any time for a few long and powerful sparks.

CHAPTER XX.

PAIN.

Varieties of pain relieved by static electricity. Its advantage over injurious drug anodynes in chronic pains. Its nutritional benefits. Sphere of action of static electricity as a pain reliever. How different methods of application affect rate of current flow. Limitations of current action within pathological tissues. The anodyne effects of the static breeze and its modifications. Indications for the breeze defined. Indications for sparks in painful states. Character of pains relieved by sparks. Leyden-jar currents applied to painful tissues. General and local sedation. Acute congestions and inflammations.

In the consideration of any of the single symptoms of disease pain will be accorded the chief place of importance, by the invalid at least, if not always by the physician. One writer divides pain into six different forms as follows:

Pain due to inflammation.

Pain due to pressure.

Pain due to stretching.

Neuralgic pains.

Subjective pains.

Cutaneous pains.

This classification presents little clinical usefulness, but the patient will generally desire curative relief from pain when it can be obtained, and palliative relief when nothing better is possible.

For the relief of pain occurring without evident diagnosis of the cause, or when not affected by treatment of the cause, or when the cause is removed and the pain persists, or when the condition is incurable, the resources of medical electricity are many and various. No exact directions can be given in advance to cover all cases, but the conditions of each case pre-

sented to the practical physician will suggest the method most likely to relieve, and if one method fails another may be tried. The skill which comes with experience will usually select intuitively the most successful form of application.

Whenever any form of electricity will palliate any incurable pain it possesses the enormous advantage over morphine, antipyrin, and other drug anodynes that at the same time it is giving temporary relief it is also imparting a general nutritional benefit.

In other cases of chronic pains in which the anodyne action of drugs most commonly employed is not only non-curative but ultimately harmful to the patient, the fact that some form of electrical current—galvanic, faradic, or static—may be administered with both curative and tonic effects is a decisive argument in its favor. The study of the control of pain is one of the most interesting in electro-therapeutics.

Static electricity is a great pain-reliever. It will temporarily comfort almost any pain that can attack the living tissues, but its curative efforts relate to pains of well-understood character. It will rarely stretch beyond its own indication and permanently cure a pain to which it is not suited. When it fails the galvanic current is often indicated. When these, singly or together, fail to cure pain, and in common with all other measures prove to give but temporary relief (as often in locomotor ataxia and cancer), they are blessed palliatives to the patient, for, unlike drug pain-destroyers which also destroy vitality, electrical currents build up the forces of nutrition.

The great sphere of static electricity by insulating methods relates to the nervous, circulatory, and muscular systems. It is not well suited to pains within bones, cartilage, deep viscera, and between articulating surfaces. It must act upon tissues within which it can exert its limited effects, and a careful consideration of the action of static electricity in painful affections will repay every student of the materia medica.

In its form of general positive electrification it very often

corrects those general, undefined, and mild expressions of pain which accompany slight constitutional disturbances.

It evidently does this through its tendency to regulate functional processes, to disturb disorderly atoms and rearrange them in better order, and to "assist nature to restore the sound state." It summons together the broken ranks of the nerve forces and influences them to march all one way; but it does not always succeed in holding them together permanently by one dose of ten minutes when reactionary forces are obstinately established. Therefore a repetition of treatment is required.

There is an old experiment which shows that when tadpoles are swimming about in a basin of water and a galvanic current is passed through the fluid, the tadpoles instinctively fall into line and swim agreeably in the direction of the current flow. I believe that some influence similar in character is exerted upon the ultimate particles of the protoplasm of the human body during the passage of an electrical current, and that the tendency of static electricity to regulate to normal action all varieties of functional derangements is explained in this way.

The energy of current action is dependent on the *rate of change*. This rate is greater with what is called a large dose than with a so-called mild dose; it is greater in any part through which the current is localized than it is through the same part when the application is general, and it is greatly increased when the localization ceases to be convective merely, and becomes disruptive.

Students of galvanic electricity will remember that the ampère is the unit of the rate of galvanic current flow, and that the number of milliampères obtained as a medical dose in proportion to the effect desired expresses simply the rate of current flowing through the tissues. The dose increase therefore of ten, twenty, fifty, or a hundred milliampères indicates the increase of intensity of action through an increase in rate of motion. Rate of movement is an equally important factor in the

practical work accomplished by all currents of water, air, or electricity.

In static electricity the *rate* is still the all-important element in therapeutic work, although not one physician in perhaps a thousand has ever had his attention directed to this rudimentary fact.

It is for this reason that large Holtz machines are more efficient than smaller ones. In administrations of a powerful static current the rate of change is least when the discharge from the insulated patient is restricted to general diffusion into the atmosphere, but every form of local application has the effect of quickening the rate of change through the powerful attraction of an opposite potential force.

The static breeze upon the head or spine is simply an immensely quickened rate of electrical change through the tissues in near relation to the discharging electrode, and consequently it increases the work done in the tissues upon the same principle that an increase in the rate of flow over a waterwheel will increase the amount of work done in the mill which it affects.

The limitations of the character of the physiological work done by static electricity are well known. It does not attack connective-tissue new formation or structural changes; it does not perform chemical electrolysis, or reorganize living tissue from the ashes of the tomb; it does not destroy specific disease germs, nor does it exert a marked influence upon the inorganic matter of bones; but acting as it does in its own way as set forth in the chapter describing its known properties, it is one of the most certain, definite, and effective remedies known to the materia medica.

The anodyne effects of the static breeze are not produced by local anæsthesia. They do not benumb. They act, so far as they are either temporary, or become permanent by repeated doses, by changing disordered sensation into orderly and normal sensation.

The static spray goes a step beyond this because it adds still more intensity to the rate of change and the local concentration.

Sparks go beyond the spray, for they bring the rate of change, however rapid it may have previously been, to an instanteous climax of wellnigh inconceivable rapidity by a complete disruptive discharge. They therefore abolish pains that refuse to budge for the coaxing of simpler methods.

If a patient who is positively charged will hold out a finger toward the negative prime conductor and attract a single long spark, he will find that it benumbs and dulls the sensation of the nerve filaments of a healthy finger-tip. When a number of such sparks are applied to a painful part they not only intensify the rate of change, and thus produce a maximum of physiological effect which is dependent upon rate, but they temporarily benumb the sensory nerve filaments wherever they strike a blow. The capabilities, therefore, of static electricity in relieving pains through the agency of modifying or increasing the rate of change cover a wide range of clinical practice; and when we add to these capabilities of the breeze, spray, and spark the mechanical effects of Leyden-jar currents, which cover the whole range of external applications of faradic currents, we must accord to static electricity the most diversified usefulness of any single agent in therapeutics.

The Breeze and Its Modifications.—Applied with proper reference to polarity and the seat of pain, the static breeze will relieve at once, and gradually cure, headaches not due to a persistent cause elsewhere, or a tumor, or condition within the head which external treatment will not reach—such, for instance, as the pain of a middle-ear abscess.

In headaches of nervous and circulatory irregularities, anæmia, congestion, insomnia, anxiety, overwork, menstruation, study, rheumatism, gout, neuralgia, cold, general debility, cerebral neurasthenia, and reflex headaches that linger after their cause has been removed, and cases of allied nature, the satis-

factory relief it speedily affords at the first application becomes permanent nearly always after sufficient treatment.

When disordered functionation manifests itself by sore and bruised feelings in the soft parts, the positive static breeze concentrated to almost a spray restores the normal circulatory state and produces comfort.

The static breeze relieves the headache of cachexias for periods varying from a few hours to several days after a *séance*, and is thus a useful adjunct to medication.

It does not cure specific pains; it will not give satisfactory relief to bilious headaches until the gastric disturbance is corrected; it may fail or succeed in severe neuralgias about the head; and every once in a while a patient will appear with a stubborn headache which baffles alike a satisfactory diagnosis and satisfactory treatment.

The head pains treated by the static breeze must be properly selected, but when this is done the remedy is very efficient.

The static breeze also relieves the pains of dermatitis, bruises, sprains, the soreness of excessive muscular fatigue and strains, local aching conditions in muscles, neuralgias near small joints or bony structures covered with little muscle, acute congestions and local or glandular inflammations, the pains of a bunion, a toothache, and the sore bruised gums left by the dentist after he has either filled teeth or pulled them out.

Acute pains due to conditions which require gentle and soothing comfort are best treated by the static breeze.

Painful chronic states which are best treated by counter-irritation or muscle stimulation are well treated by either the concentration of the negative breeze into a strong spray or by short friction sparks.

Sparks.—When the character of the pain denotes that something in the tissues needs forcible driving out, the spark is called for and the breeze is inadequate.

The particular pains relieved by static sparks are localized within muscles, fascia, and nerve sheaths.

The spark is of immense value for painful conditions below the neck, but it is not suited to pains caused by the distortion of nerve filaments within contracting cicatricial tissue or a bone callus; or pains of deep visceral neuralgia, of acute congestions and inflammations, and pains deep within joints and bones, due to diseases of the bones.

In some cases the character of the pain comes within the action of the spark, but the site of the pain is in such relation to sensitive tissues to which the spark could not be applied with comfort, that we adopt other methods by preference.

The great sphere of spark action is upon and within muscles. When exudation pressure, or the circulation in the system of irritants, such as an excess of uric or lactic acid, or the products of waste, set up pain, the spark is indicated, as well as in almost all cases of chronic inflammations, congestions, and neuralgias. The spark can usually be modified in force with a little operative skill to fit the part and to fit the pain, and will control a great variety of reflex, functional, and neurotic symptoms of a painful character.

In all the large class of pains which are called rheumatic the spark is *facile princeps*, especially when there is chronic inflammatory exudation locked up in unyielding muscular fascia and nerve sheaths. The strong spark will cause this exudation to move on and out by a process very similar to the principle of the circulation of blood in the veins and the circulation in lymph vessels.

Leyden-Jar Currents.—These static currents applied with moist electrodes in contact with the body relieve pains to which the faradic currents from high-tension induction coils are also suited and are usually employed.

These pains are chiefly of the muscular character which the spark also relieves, but the high potential small-jar current oscillating with extreme rapidity will also act upon pains deep within joints, between articulating surfaces, in the trunk of the

body, and the acute localized congestions, bruises, burns, etc., which the breeze benefits.

An ordinary sponge-covered electrode moistened with hot water is placed directly over the site of pain and connected wtih the positive Leyden jar. A similar electrode connected with the negative jar is placed so that the current will pass directly through the tissues affected with pain. The sliding poles of the machine are then brought together till they touch, and when the machine is started into rapid action the dose is regulated by pulling the poles a little apart until the current strength produces sedative relief without passing beyond the point of comfortable tolerance.

CHAPTER XXI.

BRAIN-FAG AND INSOMNIA.

Brain-fag, acute or chronic. Refreshing effects of static electricity. Technique of methods of treatment. Value of static electrification to professional brain-workers. Chronic cerebral exhaustion. Indications for static electricity. Static electricity the reverse of a mere stimulant. Its great nutritional benefits. Their permanency. Static electricity the chief agent in the treatment of states of mental exhaustion. Acute neurasthenic insomnia. Clinical illustrations. Historical examples. Suggestions for practical treatment of desperate cases. Chronic insomnias. Importance of improving nutrition. Successful treatment by electric currents. Four chief methods. The technique of static treatment. Prognosis. Cases to which static electricity is not suited.

WHENEVER overwork, mind strain, worry, literary labor, the competitions of business men, the anxieties of the physician, of a lawyer over the preparation of a case, of politicians in an exciting campaign, the tax society women undergo, or the monotonous routine of school-teaching, sets up an exhausted state of mind, there are two reparative and essential necessities—restorative nutrition and sleep. Static electricity promotes both of these.

Its immediate sedative-tonic effect is exceedingly refreshing to jaded nerves. When the restless mind refuses to obey the will and voluntarily to rest, this potent function-regulating force seizes upon the irritable and exhausted nerve cells and quiets them into the needed state of composure. The "fidgets" and fatigue disappear, and nature is given an opportunity to resume her tranquil and normal workings.

If the physician so desires he can disrobe the patient and employ the small Leyden-jar current with a negative foot-plate, passing a positive sponge electrode in turn over the surface of the body as in general faradization, which this method

reproduces. This imparts a feeling of lightness, buoyancy, and mental and physical refreshment that no drug sedative or tonic can approach. The patient is ready to seek a couch and enjoy a comfortable nap immediately after the *séance.*

The quicker method, which is practically superior to the other because it requires no removal of clothing and takes much less time, consists of positive electrification, or potential alternation, for a sufficient time to rest the patient perceptibly, followed by a strong negative spray upon the entire spine and especially concentrated upon the cervical, cerebellar, and lumbar centres.

If vertex or frontal sedation is also indicated by the complaints of the patient, a fixed electrode can apply a positive head breeze for five minutes, or the author's form of frontal breeze with an interrupted current and positive electrification for a few moments.

If the muscular system is relaxed from want of exercise and by sedentary indoor occupation, the massage effects of mild positive sparks upon the principal groups of muscles will close the *séance* most effectively and impart a sense of renewed strength and exhilaration.

In acute brain-tire under the stress of a great but temporary task this application will either speedily restore rest at the end of toil, or, if applied daily during the tax of mind, will support the powers, offset nerve waste, clear out the clogging cells, and keep the forces at their highest working pitch. To many professional men during trying emergencies the static machine would be a welcome boon if they were made aware by physicians of its existence.

In chronic cases accompanied by anæmia and general neurasthenia the restful and nutritional action of electricity is more than ever indicated for the patient, but improvement will be much slower. If the applications of static electricity in chronic cases can be made daily for a few weeks and can be accompanied by reasonable rest, outdoor diversions, and suitable hygiene, the

juncture of such practical therapeutics will produce the happiest results.

Many a prominent and brain-fagged clergyman and business man would benefit by this simple method. I have in mind as I write these lines two notable instances of breakdowns in New York pulpits, with reports of unsettled reason, and an after history of long travel in search of rest and health with but half success. Faraday himself broke down from overwork and never fully recovered, although he spent two years in quiet retirement. To these cases static electricity is fitted with peculiar and gratifying efficiency. Active brain-workers in all fields of intellectual excitement and business competitions would do well to obtain a short course of static treatment two or three times a year in advance of any threatened breakdown, for an ounce of prevention is worth a pound of cure, and few cures are more tediously obtained than that from mental collapse.

It is, however, a common experience to find that these important citizens of our commonwealth, whose brains are in the highest degree valuable to themselves and the community, and who are most liable to brain-fag, invariably consult a practitioner whose knowledge of electricity is a combination of misinforming reading and practical ignorance. Some prejudice is frequently added in the physician's mind, so that he either advises the patient that he needs nothing but "rest," or audaciously advances the conspicuously false information that he is "too nervous already, and that as electricity is only a stimulant it would do him more harm than good." Some day, when all medical colleges teach in a thorough manner the simple facts of electro-physiology along with the general facts of drug physiology, physicians who figure as specialists, but who betray the ignorance of a tyro in an important branch of medicine, will find it necessary to comprehend the relation of electricity to the nervous system.

No class of patients exists who stand in more need of the decided advantages of proper electrification than the very ones

who are often prevented by wrong advice from seeking its aid.

It is often noticeable that consultants of the greatest prominence in handling these cases are unable to suggest any medication with much confidence, and adopt the habit of referring the invalid to "time and rest." Great injustice is done the patient in hundreds of cases by such advice, and as the study of electro-physiology is open to every inquiring physician, even though he may not possess any electrical apparatus of his own, there is no excuse for failing to give the invalid's shattered nervous system the benefit of every sedative tonic and restorative agency available in practical medicine. Among such agencies static electricity stands in the front rank.

Acute Neurasthenic Insomnia.—Every now and again some case of complete nervous bankruptcy comes prominently before the public by reason of the distinguished character of the victim.

The class of cases to which I refer will be understood by all who recall the sad end of one of the great trio of New York journalists of a generation ago. For a little more than a quarter of a century he ruled supreme in the affairs of the great newspaper he created; then suddenly the next act in the drama took place in an insane hospital. The stricken heart and overburdened mind had given way, sleep was denied the man exhausted by the labors of a fruitless campaign and by acute grief for one over whose last hours he had kept ceaseless vigil day and night for more than a week. After this came the great blow of a trusted friend's supposed perfidy, and nature yielded to the strain. His tragic death speedily followed. Could sleep have been procured he might have lived another score of years.

The greatest experimental electrician the world has ever seen broke down in the midst of his immortal and unrestrained labors in 1840. Scott did the same thing when he was giving to the world the last of the most original, prolific, and successful series of novels that ever emanated from a single brain.

The history of our own feverish age of professional, political, and commercial activities is filled with examples of mental wreckage—too often followed by the climax of uncontrollable insomnia, lingering misery, or death.

A striking case in point comes before me as this chapter undergoes preparation for the press. The account made public should fix a lesson upon the mind of every practical therapeutist, and for this purpose it is repeated here:

General ——, who has been prostrated for the past few days with a severe attack of neurasthenia, was no better this morning. The General complains for the past fortnight that he has had hardly any sleep, except what has been induced by occasional doses of morphine, which, however, his physician would not allow him to have often. "I spend the greater part of the night," said the General, "in walking up and down the floor here. I feel utterly worn out, and fear the worst consequences of my illness. The most distressing symptom is this horrible restlessness and insomnia. I also suffer from severe pains in the forehead, and I find that I cannot keep my attention fixed on a book or anything else for any length of time. I cannot describe the utter despondency I feel. My doctor advises me not to lie in bed all day, but go out for drives occasionally, which I sometimes force myself to do. He often advises me not to make myself miserable about my condition, but that is easily said."

The condition described is a trumpet call for static electricity.

It is my belief that the physician who withholds from such a patient in his extremity the best resource that medical science contains fails in his duty. If the physiological and therapeutic properties of action claimed for electrical currents when rightly administered are demonstrably true—as the writer believes and knows they are—physicians who continue to disregard or ignore clinical facts of such vital importance assume a moral responsibility for which there is no excuse or warrant, for ignorance is no excuse either in the eyes of the law or in medicine.

It is well known that it is within the power of electro-sedative-tonic applications in restless states to tranquillize the

central nervous system, equalize the circulation, and restore the restfulness that is temporarily lost to the control of the will. In acute cerebral exhaustion there is little will-power left to coerce the hyperexcitability into calm and sleep. "As well," said Sir Walter Scott to his doctor, "put a kettle of water on a red-hot stove and tell it not to boil as tell me to stop thinking."

Advice does these patients little good, nor are hypnotics and drug sedatives alone to be relied on. Both physical and mental nutrition must be restored, and cardiac depressants are not infrequently dangerous. The most urgent indication in nearly every such case is electro-tonic sedation. Every other resource of medical skill may indeed be employed, but electricity in suitable form is wellnigh indispensable.

It would be impracticable to attempt to set down rules for the treatment of this desperate insomnia, for no physician could in such a crisis depend upon book study. He must understand technique in advance, or he must turn over the case to some one already experienced in electro-therapeutics who can select and modify as needed the galvanic, high-tension induction coil, or static applications. A simple suggestion which may be safely inserted here would be to seat the patient on a static platform insulated negatively and apply a strong positive head breeze, spinal breeze, and tonic spray to the region of the medulla for a sufficient time to produce a marked impression upon the great nerve centres. This would require perhaps ten minutes. Then in a reclining-chair with simple positive electrification leave the sufferer in the quiet of a somewhat darkened room with a watchful but silent attendant.

If the plates are revolved by an electric motor an hour may go by in the undisturbed repose and probable sleep of this exceedingly restful and restorative administration. It can certainly do no harm; it can be repeated once, twice, or even three times a day until the crisis is passed; it can be modified by the expert to meet every emergency of the patient's functional condition; it can be supplemented by local applications and by

any and all other remedial measures, and it will conflict with none. It is certainly a duty to point out to physicians the immense value of this agent (static electricity) when exhausted nature demands sleep as the condition on which health depends. Those who ignore the facts of electrical sedation do so against the best interests of their patients. Potential alternation would also be an admirable method.

Chronic Insomnias.—Various forms of electricity indirectly improve sleep by relieving symptoms upon which wakefulness has depended, and by regulating functions and promoting nutrition in general.

It is one of the common observations of clinical experience that improved sleep is one of the first signs of benefit even when the application is local and to parts distant from the head. This is true of all currents and of the most diverse variety of methods of technique and dosage. No electrical application is a direct and forcible sleep-compeller, but no narcotic or active hypnotic equals in kind and degree the effects of electrical treatment upon the insomnias which it can indirectly overcome.

In ordinary cases the symptom of insomnia existing in a mild degree takes care of itself in the general process of improvement without any direct attention. In other and more severe cases attempts to treat this symptom directly by an electric current may be made with:

1. Negative static electrification with positive breeze and spray impressions upon the cranial and spinal centres, or simple positive electrification, or the author's method of potential alternation.

2. The electro-thermal cabinet bath with a combined galvanic and faradic current from the cilio-spinal centre to the feet.

3. Central galvanization.

4. General faradization with either induction coil or Leyden-jar currents.

If the continuous static application is selected the patient should repose comfortably in a reclining-chair upon the static

platform holding loosely in one hand the rod or chain connected with the negative pole. Ground the positive pole and the brass point electrode.

With the machine in moderate motion sweep the point of the electrode sufficiently near the spine to produce an agreeable breeze up and down its entire length. In a moment advance the electrode closer and make a decided spray impression upon the region of the cerebellum and medulla.

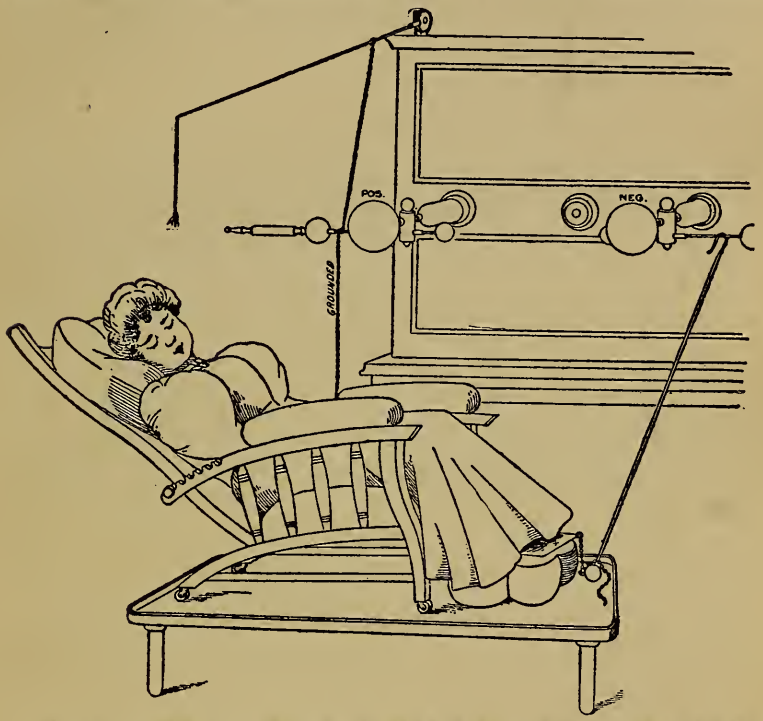
After about five minutes repeat the same impression upon the lumbar spine, and then either adjust the head-breeze electrode at a comfortable distance and continue the administration in this manner for about ten minutes, or, if thick hair, metallic hairpins, or other conditions prevent an agreeable effect upon the head, change the platform rod to the positive pole and give simple positive general electrification.

The method of applying the vibratory electrification with an oscillating potential is described elsewhere. It is exceedingly restful as well as energizing, and under its influence I have seen the patient who had been unable to obtain satisfactory and restful sleep for two weeks, declare that she felt very drowsy and was ready for a nap ten minutes after she stepped upon the platform. This method comes the nearest to producing direct hypnotic effects in insomnia of any known to me.

It is well in these cases to request patients to sit with closed eyes and compose themselves in the most quiet manner. The judgment of the physician should observe and attend to any existing conditions which prevent sleep and call for special treatment either medical, surgical, electrical, or hygienic. Digestion and nutrition very often demand attention. In many cases other resources of static electricity may be added to general electrification, but the indications for their use will be found in local conditions accompanying the insomnia, and each patient must be treated in accordance with the state presented.

Sittings should be repeated daily at first, and in private practice a sedative may be advisable at bedtime when needed until

general improvement obviates the necessity. This will refer mostly to complications of pain. Electricity is not usually a direct hypnotic, and while it is curative of the conditions on which some forms of insomnia depends, it is indirect and requires



A Static Siesta. In insomnia, neurasthenia, and many debilitated states I ground the positive pole and the head-breeze electrode, connect the platform with the negative pole, and compose the patient in this comfortable position. In other cases I omit the head-breeze electrode and simply ground the platform with the positive pole.

time. In suitable cases its benefits are more appreciable, lasting, and satisfactory than almost any other method of treatment.

It is obvious, however, that lack of sleep may be due to causes which lie entirely without its sphere of action, and the compulsory sleep produced by a narcotic is called for in a class of cases radically different from those which are suited to static electrification. Probably electricity is entitled to rank first as a curative agent in ordinary curable cases of insomnia.

CHAPTER XXIII.

MISCELLANEOUS CONDITIONS.

Habitual subnormal temperature. Efficiency of static currents in regulating to normal. Treatment. Glycosuria. A clinical case. To abort an incipient cold. Stiffness and soreness of the neck muscles following acute inflammations of the throat. Treatment. Cold extremities. Treatment. Constipation. Colic. Varieties relieved by static sparks. Nausea relieved by the static breeze. Exudations, infiltrations, and localized œdemas. Static methods of treatment. Indications for different forms of application. Effects of treatment and frequency of sittings. Chronic varicose conditions of the lower extremities. Methods of giving practical relief to symptoms by static electricity. Chronic synovitis. Two efficient methods of treatment described.

Habitual Subnormal Temperature.—Many neurotic, neurasthenic, and anæmic states present temperatures from one-half to one and one-half degrees below the normal. Positive static electrification applied for about fifteen minutes raises this temperature to normal. The patient then experiences a sense of well-being and of improved health. When the electrification is repeated daily, or every second day, for a short time, the temperature remains normal and the general improvement in health becomes established. Local applications to the spine will hasten the improvement.

The static current is a mild but very efficient regulator of abnormal function. Heart action, respiration, pulse, and temperature are all adjusted by it to proper action when the derangement is functional only. Even in organic disease it tries to do the same thing and helps materially. It is therefore a valuable auxiliary aid to treatment in various pathological lesions which it cannot directly treat.

Glycosuria. — Mrs. J——, aged 52, widow three years. Dressmaker. Complains of extreme nervousness; is easily

alarmed; has violent headaches; arms below the elbows and legs below the knees fall asleep and get numb in the night; her fingers sting when she gets nervous. She often has cold chills up and down the back, and a feeling around the pelvis as if she was in a bath of ice-water. Has severe pain at the back of the neck and lumbar spine; sleeps very poorly; is constipated; had malaria a year ago. Is extremely anæmic and neurasthenic; is almost unable to pursue her vocation.

On February 26th she had fifteen minutes of positive electrification, with two minutes positive breeze to the spine and occiput. She returned on March 1st; reported that on the night after her first treatment she had had the first dreamless and sound sleep for years; had felt much better for about one day, but since then had felt about the same as before. She was therefore in a hopeful frame of mind, although she had been under constant medical treatment almost continually for three years without any satisfactory relief.

The same treatment was repeated on March 1st, 3d, 5th, 8th, and 10th, making six treatments previous to this writing. She states to-day that she is "indescribably better." She "sleeps very much better, the circulatory disturbance has practically disappeared, she is less nervous, and not only does she herself feel like a different woman but her friends all remark the change. She has little backache and very little headache at any time." An interesting point in this case has just appeared. At the fourth visit, by more careful inquiry into her state, she gave information which she had withheld before. She was passing only about a pint of urine per twenty-four hours, and it was exceedingly irritating. She was requested to take sample to a pathologist for examination, and glycosuria was reported present. A second specimen was requested, and I am now awaiting the final report of the analysis; but without any medication whatever or any change in her diet or habits, the improvement produced by six administrations of static electricity in twelve days has been of a character which probably

no other remedy known to medicine could demonstrate. She will continue treatment, and whatever additional service medicine can contribute she will of course receive, but thus far she has had nothing but static electricity while in my hands.

To Abort an Incipient Cold.—The strong tendency of static electrification to restore to normal the functional processes is most strikingly displayed within the nervous, circulatory, and muscular systems. I have often observed its efficient action in the first stage of a "cold," and the following case is but one of many. It is only selected because it is fresh in mind as these pages are being written.

Miss —— complained one morning of having caught cold the night before; had been awake all night; complete anorexia, nausea, headache, creeping chills, gooseflesh, extremities cold, head hot, and general prostration.

Placed her upon the static platform, positively insulated, negative pole grounded. After five minutes of this positive electrification her symptoms ceased. Head became comfortable, hands and feet warm, nausea absent. Closed *séance* in fifteen minutes to attend to other cases, with the result that symptoms soon reappeared, though with lessened severity.

Two hours later she was again subjected to same positive electrification maintained for *thirty* minutes after all symptoms ceased. She spontaneously declared that she then felt as well as ever, and has since remained so.

There are two lessons enforced by my experiences of this kind with static electricity in acute disturbances: one is, that when no invasion of febrile disease is taking place positive electrification or some static adaptation to the case will direct again the functions into a normal state; second, that the usual short *séance* is ineffective, and that two or more long sittings repeated on the same day will sometimes abort a condition that would otherwise prove tedious and annoying.

Aconite, phenacetin, quinine, and other drugs are prescribed with confidence for these patients, but often fail. My own confidence in static electrification has been the result of actual experience, and if it is possible to give the patient the benefit of

both current and medication, the liability of disappointment is reduced to a minimum.

Stiffness and Soreness of the Neck Muscles Following Acute Inflammations of the Neck and Throat.—When patients are undergoing extended treatment for chronic affections it not infrequently happens that some one of them will suffer from an intercurrent tonsillitis or myalgia of the neck or shoulder, and make the next appearance with a stiff and lame neck. Sometimes they think it is necessary to stop treatment and stay home while they apply liniments or mustard plasters for relief.

A moment's application of warm spray from the brass point electrode followed by a few mild sparks from the same source will give a sense of relief, comfort, and satisfaction that can be equalled in absolutely no other way. The transition from aching discomfort to natural freedom of movement without pain does not take thirty seconds in some cases, and rarely more than five minutes.

If the case is recent, one, two, or possibly three brief applications will make the relief constant.

If the trouble has been neglected and has grown chronic, the treatment is the same, and the final result is the same, but it takes longer and requires several more repetitions.

In chronic cases the application may be made more stimulating by increasing the number of sparks applied.

Cold Extremities.—If these are part of a general condition undergoing electrical treatment, this symptom usually disappears entirely in the course of improvement. If it is due to hepatic torpor, anæmia, or incurable cachexia of any kind, it is not likely that local applications of electricity will produce other than temporary effects and the main treatment must be directed to the cause.

If, however, the coldness is due to disturbances of the nervous system or circulation, or to simple debility, or to any other constitutional or local cause that electro-therapeutics will remove,

the correction of cold extremities requires but a moment's extra attention in the course of the regular sitting.

The general action of positive electrification, and especially when interrupted by the author's method, tends to equalize the body warmth, but in cases in which natural reaction is not taking place during other treatment a few mild sparks should be applied to the soles of the feet through the shoes, and also to the lower part of the forearms.

This is not only effective in warming the feet and hands, but imparts a warmth of a peculiarly agreeable and satisfactory character. Patients coming to the office in the winter-time and who arrive in a cold state, often speak of the gratifying sensation of comfortable warmth which quickly pervades the system during treatment. Under ordinary circumstances it is not usual to administer sparks to the soles of the feet, but I am in the habit of doing this always when the feet are cold, and the effects of the application are always appreciated. They are a sovereign remedy.

Constipation.—Static sparks are not curative of constipation *per se*, but in many cases of general negative states of the health other appropriate measures are advantageously supplemented by the nutritional effects of sparks upon the spine, lumbo-sacral plexus, and abdomen.

As they can be administered in a couple of minutes without removing any clothing, they can often be employed when local applications of galvanic and faradic methods would be out of the question. In this way constipation may sometimes be relieved, but as a direct remedy for chronic constipation static sparks are utterly inadequate. Their usefulness is to be found in their facility of application during the course of treatment for states in which constipation is a minor symptom.

On the 10th of August, 1781, one of the most capable and well-informed medical electricians of that time wrote to a member of the royal society of London:

In the course of my practice I have observed a very remarkable

effect of electricity upon the human body, which is, that it removes costiveness in those persons that are electrified, especially along the course of the alimentary canal. I must observe that it does by no means increase the evacuation of ordinary good habits of the body but only reinstates the usual discharge in case of costiveness. This effect seems to take place because the electrization gives vigor and energy to the fibres of the debilitated intestines in the same manner as it restores the motion of more external muscles.

Colic.—I have repeatedly given relief to lead colic, flatulent colic, etc., by static sparks over the gastric region in cases who were thus affected at the time of coming for other treatment. It would scarcely occur to a patient to seek relief from colic by a visit to the electro-therapeutist, but it is sometimes useful to know that such symptoms can be relieved without extra trouble during a regular course of treatment for some more formidable affection.

Nausea.—I have relieved a number of cases of simple nausea occurring in patients undergoing treatment for other conditions, by a few moments' application of the static breeze to the region of the stomach. In other cases dependent on uterine reflexes bipolar faradic sedation has removed the nausea, and even in the "morning sickness" of pregnancy it has given as much relief to the patient as any other remedy tried.

Exudations, Infiltrations, and Localized Œdemas.—When these are situated superficially, and do not present the induration which calls for negative galvanic electrolysis, static electricity may be applied as a spark or as a Leyden-jar current.

First and simplest is the spark application. Insulate the patient negatively and ground the positive pole. Also ground the brass ball electrode to the gas fixture.

If the state is recent, circumscribed, and soft, apply but a few mild sparks at a time. If there is a possibility of setting up an active inflammation when a low grade of inflammation is present, use a positive and sedative spray until irritation ceases and then proceed with the spark.

If the condition is old, sluggish, and insensitive, and vigor-

ous stimulation is indicated, apply long, thick, powerful sparks in abundance. If the part aches, feels heavy, numb, and cold, these symptoms will be quickly relieved and reabsorption of the infiltrated fluids will be rapidly brought about by strong sparks.

There is sometimes an advantage in using the rapidly interrupted Leyden-jar current as a vasomotor constrictor for the absorption of exudations, and it possesses the very great advantage of being more agreeable than sparks, and if the dose is regulated properly it is not only free from the danger of lighting up a slumbering inflammation, but it can be made extremely sedative to congested and inflamed tissues.

The principle of application involves simply placing a moistened sponge or felt-covered electrode upon each side of the part and passing through the tissues a current interrupted with extreme rapidity, and of a strength which is agreeably borne.

If a considerable part of a lower extremity is affected, a larger electrode connected with the positive pole may be placed under the sacrum or on the anterior part of the thigh while the negative electrode is promenaded in the course of the blood-vessels of the œdematous tissues.

Treatment by either form of application should afford positive relief at each sitting and be repeated every second or third day until benefit is established and further improvement ceases. If the case is very recent, and will require but a few applications, they should be made daily.

Chronic Varicose Conditions of the Lower Extremities.—In these old cases there is often enlargement of the leg, severe aching and pain, and inability to wear a shoe or to walk, except with difficulty and for short distances. I do not refer to simple varicose veins, but to states of long-standing, chronic congestion, and rheumatic symptoms associated with the varicosis.

An elastic stocking has many drawbacks, and is an exceed-

ingly poor excuse in the way of treatment. Static sparks are far better, and possess remarkable value in affording symptomatic relief when the anatomical integrity is irreparable. Relief from the sense of heaviness, aching, and pain, and the ability to wear a shoe and to walk with comfort is frequently all these patients require to make them grateful, and static electricity will afford them this relief as certainly as anything in medicine.

Seat the patient upon the static platform connected with the positive pole, ground the negative pole, and ground the brass ball electrode. Revolve the machine rapidly enough to produce a strong current, as the tissues are generally insensitive to sparks, and not only do not benefit from mild applications, but the patient enjoys a rather agreeable sensation from powerful sparks, such as are required to relieve.

Apply long single sparks at the rate of about sixty per minute over the entire affected part except the "shin bone," which is too sensitive to endure such an application. If the ankle is œdematous, sparks will reduce the infiltration and increase the mobility of the joint. Only a very moderate decrease in the size of the leg may take place, but all pains and aches will be removed, the sense of great weight will be superseded by a feeling of buoyancy, shoes which pinched before can be worn with comfort, the walking ability and endurance will be restored, and the condition will cease to cripple the patient.

These effects are produced at each *séance* in less than five minutes' time. For the general improvement of the patient I am accustomed then to change the platform connection to the negative pole and apply mild positive sparks to the other leg, to both thighs, and to the spine so that the patient leaves the office "feeling as good as new."

When treatment is first begun the sittings should be daily until painful symptoms are removed, and then three times a week for a couple of weeks longer. If relapses occur during the years to come, a short course of treatment may be repeated

at any time, and the patient can thus maintain the comfort of a practical cure even though the appearance of the leg may not have improved to the same extent as the symptomatic relief.

Chronic Synovitis—"White Swelling" of the Knee-Joint.—Static electricity offers two efficient methods of treatment—sparks and the Leyden-jar current.

Insulate the patient negatively, ground the positive pole and the brass ball electrode to the gas fixture. Apply mild sparks to the affected joint, or stronger ones if they are well tolerated. Request the patient to bend and pose the joint to bring out the local pains during treatment and in each position spark the tissues until relief ensues. Repeat every second day until improved and then three times a week until benefit ceases.

If the part is still sensitive and sore to the touch sparks will not be tolerated, and the Leyden-jar sedative-tonic application may be made far more agreeable. Apply two sponge-covered hand electrodes to the opposite side of the joint, connect the smallest jars in circuit with a short spark-gap, rapid action of the plates, and a mild current.

Pass one electrode very slowly over the area affected while the other is held stationary. The question of polarity is not important, and if the negative electrode is somewhat larger than the positive the sensation of the two will be about the same.

Continue the application until all stiffness and pain are relieved. If any particularly sensitive spot is found, hold the positive electrode upon it, with a regulation of the dose at the point of comfortable tolerance, until sedation is complete.

CHAPTER XXIV.

HEART DISEASES, CHRONIC GRIEF, AND WEATHER NEUROSES.

Functional heart derangements. Indications for static electricity. Its benefits and its limitations. Necessity for proper selection of cases. The treatment of chronic heart diseases. The great value of static electricity in suitable forms of administration. A review of other methods of treatment, showing the advantages offered by static methods. Its nutritional value in incurable cases. Clinical examples of organic and functional cardiac lesions benefited by static electricity. Acute or chronic grief. Effects of grief upon the human organism indicating the sedative-tonic and nutritional actions of static electricity. Clinical remarks upon treatment. Weather neuroses. Symptoms worse from weather changes. Their cause. Treatment by static electricity. Its nutritional and function-regulating influence in these morbid states. Methods of application.

Functional Heart Derangements.—So far as these are caused by other conditions which are satisfactorily treated by medication, there will be little occasion to employ any form of electricity in their treatment.

To relieve the patient's anxiety, however, to restore the nervous tone, and assist in transforming irregularity of the cardiac function into a normal process, general positive static electrification will always be useful and possesses a definite value.

If the case is recent and due to a temporary disturbance, one, two, or three applications will be found sufficient.

If the patient is anæmic, debilitated, or in any chronic condition which deters the heart from normal action, such patients can be benefited in so many ways by static electricity repeated three or four times a week for a couple of months that it is good practice to employ it.

If palpitation and irregularity are caused by acute dyspeptic states, other measures are of course simpler and less expensive

to employ, and as they are entirely adequate I never suggest electricity to such a patient.

If chronic dyspepsia accompanies the cardiac disturbance, or causes it, the action of static electricity will be much less favorable when there is a low grade of catarrhal gastritis present than when the dyspepsia is of the nervous type. As a matter of fact, static electricity is apt to be disappointing in the treatment of many conditions of the digestive tract, and apart from the fact that it is less suited to some of these cases than others we encounter the additional difficulty of combating the aggravation caused by each of three meals a day by treatments which are seldom administered more than three times a week, while medical remedies are given after each meal.

If the cardiac neurosis is simply part of a general neurasthenia static electricity is the remedy *par excellence.*

The Treatment of Chronic Heart Diseases.—As a remedial agent with a marked tendency to regulate and sustain the normal functions of the body static electricity becomes one of the best of heart tonics and is probably the very best extra-drug therapeutic measure in both functional and organic diseases of the heart.

The following remarks refer to heart affections with cardiac inefficiency. The precise character of the lesion is of subordinate importance as compared with the fact of inefficiency or the liability of heart failure from lack of compensation. In order to bring out an appreciation of the full measure of value of static electricity in these cases the physician should carefully read the preceding chapter upon the actions of static currents within the living tissues and compare them with the following excellent summary of modern treatment by Satterthwaite.

There is a widespread and a growing interest in this matter (the treatment of chronic heart diseases), and I am firmly convinced from an investigation of it that we are able to do much more for these cases at the present time than we did a few years ago.

The older methods, as we all know, were, in the order of importance named, first, complete rest, venesection, and hydragogue

cathartics, followed by the usual heart tonics; and this antiquated system in the above order of values has been advocated in one of the latest American books on the practice of medicine.

I admit that there is a positive advantage to the wearied heart from the absolute rest from toil or worry that comes from a complete suspension of bodily or even mental activity; and that a certain amount of rest in bed may be desirable occasionally and for brief periods. But any improvement gained by this treatment soon ceases unless the enforced rest is supplemented by some activity of the muscular system, whether active or passive; or some additional relief for the overloaded heart by the use of one or other of the numerous remedial agencies we have at our command. Treatment by venesection and the old-fashioned hydragogue cathartics we need hardly allude to. The former, as will be generally admitted, has had its day; while the latter are certainly and rapidly being replaced by other remedies that are both efficacious and more agreeable to our patients.

Next in order I will speak of *diet.* I feel that this is a most important topic. In many of these chronic cardiac cases I agree with Grainger Stewart, who has recently reviewed the new methods of treatment in cardiac diseases, that the nitrogenous food should be increased, while the carbohydrates should be reduced; but I do so for two reasons. First, that a less amount of food is required by the body; and second, that by diminishing the carbohydrates we lessen fermentation, and so reduce to some extent gaseous distention of the stomach and its necessary result, pressure on an already distended heart. But I am opposed to in any great measure restricting the use of the carbohydrates, because they are needed to supply energy to the system. With these qualifications as to the kind of food, it will be seen that I favor a *mixed diet.* It is common to advocate a diminished use of liquids, but in many cases, as when lithæmia is associated with cardiac disease, there is an excess of uric acid found in the secretions. In these cases I advocate liberal potations of fluid. Chemistry teaches us that uric acid is readily dissolved in water, and practical experience shows us also that lithæmia is also greatly benefited by this liquid. Hence I favor the free use of water and am opposed to the so-called *dry-diet* system; but I do not advocate taking large quantities of fluid with the meals. Fluids should, in these cases, be taken between meals, if a large amount is to be taken. Where it is practical, diffusible stimulants, as, for example the aromatic spirits of ammonia, may be substituted with benefit for alcoholics. Tobacco, coffee, and tea, as a rule, are to be prohibited, and yet there are notable exceptions as to coffee and tea. Sometimes coffee is so great an aid to stomach

digestion that it is almost indispensable. Tea, if taken, should be weak. In these matters experience, skill, intelligence, and tact on the part of the physician are of the very first importance.

Next in order, in my opinion, come *regulated exercises*. It may be remembered that these were hinted at by Stokes some forty years ago, but he did not appreciate their real value, and did not systematize them. Of first importance are the modern systematic resisted movements, and are associated with the name of the Schott brothers, of Nauheim, in Germany. It appears that these men, while treating neurasthenics, found that in forcing the blood to the nerve centres, the volume of the pulse was increased, while at the same time its rate was diminished. As this result was desirable when treating loss of compensation in heart disease, they applied the method in these chronic cases with such satisfactory results that they have been recognized and employed by many of the practitioners of Europe.

In all, there are three classes of exercises practised by the advocates of movement. First in the severer cases, as in dropsy, or in very feeble patients, there are passive movements and also resisted movements by the physician or operator, who may also employ light but not deep massage. Second, there are slow voluntary movements of the patient resisted by the operator. Third and last, there is the Oertel treatment or some modification of it, an elaboration of Stokes' idea—the so-called mountain-climbing method.

In the Schott system, the exercises are all extremely gentle; the physician or his assistant always stopping short (in the movements) of any weariness on the part of the patient, and its resultant rapid breathing or increased rapidity of the pulse. If either of these undesirable phenomena occur, the exercises are immediately suspended and the patient is made to rest; and in any case, after each variety of movement there is always a breathing spell. The attendant never grasps the part with force, but with some firmness, and supports the patient with both hands while he resists each movement, and he always restores the limb to its original position, whether the patient is standing, sitting, or lying down. Both hands of the operator are always needed to give the movements in the manner most agreeable; meanwhile the patient is instructed to breathe naturally. If there is any paleness of the alæ nasi, the movements are at once arrested. A fundamental principle underlying this treatment is that each muscle of the body is to be made to work with a gradually increasing force, continuing to the close of the treatment. The movements are simple in character, being flexion, extension, abduction, and rotation, applied as nearly as may be to the limbs, neck, and trunk. The experience and intelligence

of the physician are naturally of vast importance if the treatment is to be successfully carried out in each case. It is not a routine method.

After each *séance* the heart is examined and also the pulse. Usually the heart is improved in action and with it the pulse, and the heart is more or less contracted. During a complete course these changes are at first more or less evanescent, but finally become more permanent. The patients also express themselves as feeling better, or else there is some improvement noted in the physical signs. The *rationale* of successful treatment is explained in various ways, but it is generally believed that the muscles during these movements, constituting as they do from one-half to one-third of the weight of the body, empty the veins and lymphatics during contraction, and in so doing diminish the peripheral resistance, as it is called, so that the arteries, which are not squeezed by the contraction of the muscles, have less resistance, and can therefore carry the arterial blood in them with great ease and completeness to the periphery. After a variable time, however, following each *séance*, the venous blood and lymph flow back again to the periphery and again the heart is in labor. But it has already gained some relief, and after every successive day of treatment it is apt to gain steadily in tone. The resisted movements are designed to produce tonic contraction of the muscles just short of producing a sensation of weariness in the patient. It will be seen that this method is best adapted for cases that still have a fair amount of cardiac tone remaining.

Most or all of these plans are modifications of the Schott method.

The Oertel plan is for the patient to climb hills, increasing the distances gradually. At Nauheim these distances are marked by guide-boards (*Terraincur*). This method is certainly not applicable in severe cases, for the patient must have considerable strength in the cardiac muscle to attempt it. Accordingly, it plays an inferior rôle in heart treatment. Sometimes these various plans are more or less modified, but, on the whole, the Schott treatment has met with the most favor and appears to have given the best results.

Next comes the *treatment by baths*. In this plan the patient is immersed in a bath of warm salt water that has been carbonated. The effects of these baths, in my experience, are much the same in quality as the exercises, but on the whole they are less efficient. In the case of a young girl with a dilated heart, the result of congenital disease, I examined the apex beat with the finger before the bath and then after it, and found that the apex receded toward the median line fully three-quarters of an inch. while the pulse fell

from 124 before the bath to 100 five minutes after the bath. Meantime the pulse increased in strength. The bath lasted four and a half minutes. The system adopted in these cases is as follows, usually: After a variable period of rest, before beginning the course in severe cases, the patient is immersed in a warm and slightly saline effervescent bath; the duration of the immersion being from four to fifteen minutes, and the temperature 95°. Then, as the course proceeds, more and more salines are introduced, and more and more carbonic-acid gas. After every third bath or so there is an intermission of a day, and this period is taken by the physician to auscult and percuss and make such other examinations as are necessary. Assuming that a course lasts from four to eight weeks, while the potency of the bath is thus gradually increased, there is usually a coincident reduction in the temperature, which may be carried down to 85°, according to the capacity of the individual for agreeably sustaining such a fall of temperature. In feeble cases, where the cardiac tone has been lost, baths will restore it sooner than exercises. When, however, from any reason, baths cannot be employed, the method by exercises will produce satisfactory results, though a longer period will usually be needed.

The theory of these baths is uncertain. It has been claimed by some that the warm water relaxes the arterioles of the skin, and so overcomes the natural resistance, admitting of stronger and slower action by the heart. Others maintain that the action is reflex from the nerves of the skin to the arterioles of deeper parts. Others again have held that the effect is mental. According to Grainger Stewart's experiments, the effects are chiefly due to the carbonic-acid gas in the water. It numbs the skin. Stewart tried various kinds of warm baths, but the diminished area of cardiac dulness with improvement of the pulse only followed after the introduction of carbonic-acid gas into the bath. But both exercises and baths are only useful up to a certain point. After this point has been reached they are harmful. To make this treatment effectual, it is very important that the patient resume his work gradually, accustoming himself to it by slow degrees. Cases that are to be specially avoided in the treatment by exercises and baths are: acute heart affections of any kind; aneurisms, except in the very early stages; and arterial sclerosis, when it is well marked. To get the full benefit of this course of treatment the patient should follow it up by two or three weeks of rest at some climatic resort of medium altitude.

In conclusion, I will briefly review our medicinal remedies. Of these, digitalis still continues to stand at the head of the list, whatever theoretical objections may be urged against it in special cases.

Next in order comes, with a wide interval, strophanthus. It acts promptly, and is often useful in emergency cases, but is unreliable in action, and should not be continued for a long period. Caffeine is a safe and reliable remedy in many instances. In old cases of stiffened arteries, I have had great benefit from nitroglycerin, while iodide of sodium and iodide of potassium are valuable in many cases, because their use can be prolonged. They are especially serviceable in lithæmia. All cardiac tonics should be used cautiously in a fresh exacerbation, such as may occur in rheumatism. In this connection I should warn against the use of strychnine. In the neurotic forms of chronic functional disturbance, great benefit may be obtained from meals taken at short intervals. Bromides and other sedatives, or even preparations of opium, may also form essential parts of the treatment; but we may be able to succeed without them by the use of sulphonal or paraldehyde. Such has been my experience. Finally, arsenic and iron must not be forgotten as valuable adjuncts in certain classes of cases.

Apart from the beneficent action of general static electrification upon purely functional processes, the mechanical superiority of static massage or muscle-contracting applications for exercise, nutrition, and general muscular tone, to the crude and clumsy methods advocated by Oertel, Stokes, and Schott must be at once apparent to every one who is familiar with the best electrical methods.

The treatment by baths also possesses disadvantages as compared with static electricity. Both baths and exercises must be employed with a careful selection of cases and great care in the adaptation of treatment to each individual condition. They are tedious in detail, slow to act, and require to be kept up for a long period.

The *rationale* of successful treatment by these methods does not differ in any important way from the actions of appropriate static administrations. The greatest difference lies in the fact that with static electricity the patient may be treated by the physician himself without delegating any responsibility to either the patient or a third hand, and that: (1) the treatment is accomplished in ten or fifteen minutes with the patient seated in a comfortable chair and not subjected to any exposure;

(2) there is no removal of clothing; (3) the care in selection of cases is reduced to a minimum, for general electrification and its mild action in aid of the normal functions is suited to every case that can by any possibility come to the office—and local methods which may be superadded for symptomatic conditions are wholly devoid of danger in the hands of any physician who possesses ordinary skill in electro-therapeutics; (4) the benefits of treatment are more agreeably obtained, more quickly apparent, and are maintained at a point which keeps the patient comfortable with far less time and trouble than the Schott exercises.

When the patient is anæmic and weak and cannot get warm or keep warm, or has advanced to other marked disturbances of the circulation, the action of drugs and the precautions of hygiene may be efficiently aided by means of the static apparatus.

The following cases were reported by Caldwell:

Mr. G—— came to me with organic heart disease. Upon examination I found an enormously dilated heart, and he was suffering from all the aggravated symptoms that come with such a condition—shortness of breath, radial pulse very intermittent and irregular, cold extremities, and inability to lie down at all for fear of suffocation. Altogether, after finding out his true condition, I hesitated about giving him any treatment, fearing he might die some day in my office and it be said electricity had killed him. He was one of the first of such patients I had had an opportunity of trying the static current on, and I gave it cautiously, using the positive insulation for eight minutes three times a week. It had the effect of a heart tonic, strengthening and quieting its action. The pulse grew stronger and less intermitting, the breathing better, and at times he was able to lie down. While the patient was not cured, his last year was rendered much more comfortable by the treatment.

Rev. Mr. —— came to me suffering, he said, with heart disease. Palpitation, vertigo, irregular pulse, a great deal of occipital headache, with insomnia, were some of his symptoms, and he was greatly excited with the fear I would tell him he must die. Upon examination I found there was no organic lesion whatever; merely a functional condition due to mental overwork. The pulse would intermit about every fourth beat. In

this case I employed the negative insulation for ten minutes daily, and after the second treatment he was entirely relieved, as far as his "heart disease" was concerned. In two months' time discharged him cured.

Mr. W——, a young man, by trade a printer, came to me in a condition similar to second case, though more highly aggravated, and also suffering severely from dyspepsia, which caused a great deal of flatulence, especially at night, after dinner, when the fulness caused by it was very oppressive. His condition was induced by his running rapidly up seven flights of stairs to his business office rather than wait for the elevator, and he was in a very excitable, nervous state.

I gave him negative insulation five minutes, positive direct head breeze four, and positive direct breeze down the spine four minutes; treatment given three times a week.

The most aggravating heart symptoms were relieved at once and have never since returned, and the dyspepsia was speedily cured.

Dr. W. S. Watson reports a typical case:

Mr. W—— came to me suffering with, as he stated, heart failure. He was troubled very much with the shortness of breath and palpitation, some considerable vertigo, pains in both parietal regions, which disturbances unfitted him for his employment. The patient was a man of full, plethoric habit, just such a man as one would expect to see come down with apoplexy. Upon examination, I found no evidence of any organic lesion, trouble entirely functional, palpitation due to the accumulation of gas in the stomach, as is often the case, and to disturbance of the portal circulation and an excess of uric acid in the system, all of which conditions are amenable to the static current.

Treatment was begun by giving him ten minutes of positive static insulation, followed by static breeze up and down the spine and laterally to both temporal regions. After the first treatment the shortness of breath subsided very largely, the extremities became warm, and the palpitation less frequent. After the third treatment he felt like a new man, could walk off at a brisk rate a mile or more, and experience none of the alarming feelings. Treatment was continued every second day for about three weeks, when he was discharged without any remaining evidence of biliary disturbance or excess of uric acid.

Acute or Chronic Grief.—The effects of grief upon the human organism are often equivalent to the effects of a slow-

acting poison. Grief and shock, from a medical standpoint, are conditions admirably considered in the following citation from a recent writer:

> Medical observations show that the physical result of depressing emotions are similar to those caused by bodily accidents, fatigue, chill, partial starvation, and loss of blood. Birds, moles, and dogs, which apparently died in consequence of capture, and from conditions that correspond in human beings to acute nostalgia and "broken heart," were examined after death as to the condition of their internal organs, and it was found that the nutrition of the tissues had been interfered with, and the substance proper of various vital organs had undergone the same kind of degeneration as that brought about by phosphorus or the germs of infectious disease. To urge work, study, travel, the vain search for amusements, is both useless and dangerous. For a time the whole organism is overthrown. Readjustment comes slowly. Sorrow, grief, and all great misfortunes should be regarded as conditions similar to acute infectious diseases, which they resemble in result, and later as convalescence from such diseases. Seclusion, rest, sleep, appropriate food, fresh air, sunshine, interests that tax neither mind nor body, these are requirements in this class of illness.

To this writer's therapeutics for this class of cases should be added general electrization. No one informed of its nerve-toning properties and nutritional effects could withhold from these patients a remedy equally indicated with sunshine, diversion, and rest. I have had the opportunity of corroborating its effects in tranquillizing overwrought emotions and in the profound melancholia of sorrow, also in severe shock, two cases of which I recall very distinctly, and my views of the value of nutritional, sedative-tonic electrization have been confirmed by personal experience in a large number of instances. It is more rational and satisfactory to all concerned to treat intense grief as a disease and shorten its duration by the efficient use of electricity than to leave the patient to time and circumstances to outgrow it.

In the treatment of the great class of diseases and symptoms which require functional regulation or nutritional improvement, general restorative measures are nearly always indicated. So

far as these come within the resources of electro-therapy the advantages of static applications are decided.

Static treatment may be quickly given without taking off a garment, and its physiological action upon the general functions and the processes of nutrition are more practically available than similar actions of other currents.

In office practice the static machine will enable the operator to retain cases that he would otherwise abandon, or who abandon him because of discouragement as to results. The loss of these cases will soon offset the cost of the machine.

Although facility of application is a point that is justly dwelt upon by every experienced operator of the static machine, and short *séances* are cited as the rule, yet too much haste is not advisable in general administrations. The beginner especially will do well to take plenty of time. Much better results will accrue in the long run to the operator who takes fifteen or twenty minutes to do deliberately what only an expert can crowd into half the time.

Weather Neuroses.—There are various well-known diseases of the nervous system whose symptoms, or at least the intensity of whose symptoms, are greatly influenced by the state of the weather. This is true both of diseases which may be demonstrated anatomically and of various neuroses.

Examples of the former are the lancinating pains of locomotor ataxia, chronic myelitis, meningomyelitis, multiple neuritis, and various neuralgias. Examples of the latter are hysteria, neurasthenia, and epilepsy.

It is also well known that the state of the weather influences the disposition, desire, and ability to work of a great many nervous people. In addition to these conditions there are, however, various others whose presence is manifest only during certain states of the weather. At other times the patient usually makes no complaint. The symptoms of these weather neuroses are pain, often of a lancinating character, disordered sensibility, and muscular weakness.

The localization, distribution, intensity, and duration of these are subject to great variation, and complications may exist with other nervous conditions, such as neurasthenia, etc.

The development of these neuroses is usually due to anomalies of *nutrition*. The majority of cases of pains in the joints and extremities in old people which are usually considered as chronic muscular rheumatism are regarded by Lowenfeld as more properly to be looked upon as weather neuroses. In health there is a perfect adjustment between the centrifugal pressure of the circulation and the centripetal pressure of the weight of the atmosphere. Changes in the latter, as indicated by the fall in the barometer at the approach of a storm, are readily compensated for in the softer tissues by the freer movements of the nerve fibres when the intravascular pressure is unbalanced, but in the denser fibrous tissues of the body the nerve filaments cannot escape from pressure and consequently express themselves in pain. The susceptibility of patients with any form of fibrous-tissue inflammation, rheumatic, gouty, etc., to changes in the weather is due to a similar cause.

Lowenfeld refers at some length to these conditions and summarizes treatment in the brief remark that it should consist of "electricity to the back and over the course of the nerves, with attention to the general nutrition." Equally indefinite are most of the references to electricity in books of general medicine. Without hint as to current, polarity, dosage, or manner of treatment, the practising physician is unable to follow such a writer. These symptoms of disordered nutrition, these peripheral neuroses, call for nutritional applications of general static electricity.

Seat the patient upon the platform connected with the positive pole and apply a strong positive charge—preferably potential alternation—for about five minutes. Then stop the machine, connect the platform with the negative pole, ground the positive pole to the water pipe or gas fixture, and also ground the brass point electrode. With the plates in vigorous action

apply a positive spray to the spine for three minutes by sweeping the point up and down its entire length, just far enough away to avoid a spark.

Apply the same spray to the forehead, vertex, occipital region, or any part of the head which may be subject to pain. Below the neck attack the sites of pain with the grounded brass ball electrode, which should be next substituted for the metal point. Apply sparks to the entire spine, to the muscular parts of both upper and lower extremities, and to the distribution of all nerves manifesting symptoms. The first application should be very mild, and the later dosage adjusted to the patient's needs, according as the improvement progresses or relapses. Devote five or more minutes to this part of the *séance.*

If the patient is elderly or feeble a semi-reclining chair with cane back and cane seat should be employed, so that the full sedative-tonic, nutritional effects of the positive electrification and breeze may be realized with the system at complete rest, and in these cases the use of sparks should be delayed until late in the course of treatment, and unless they are indispensable they should be omitted altogether.

Repeat treatment three times a week in chronic conditions, but in acute exacerbations the sitting should be daily until relief becomes sufficient to extend the time. Those who do not possess a static machine but wish to employ electricity, may attempt to combat these conditions by general faradization.

CHAPTER XXVI.

HEADACHES.

The local treatment of pain in the head. Constitutional treatment by static electricity. The advantages of curative effects over drug palliation. Methods of employing static electricity. Kinds of headaches static electricity will permanently relieve. Varieties in which its action gives only temporary relief. No other single agent so satisfactory in the treatment of headaches. Migraine. Its successful treatment by static electricity. Good effect upon the patient's general health. The relation of common conditions to success or failure in general electro-therapeutics.

For the relief of headache during an attack static electricity in the form of a breeze or spray directed upon the part of greatest pain is an efficient measure in congestive and nervous headaches and some others.

The local treatment of pain in the head is perhaps the least important part of the influence which all forms of electricity exert in the relief and cure of headaches. The symptom is so common an accompaniment of derangements or disease elsewhere than in the head that local treatment is required in only a very small proportion of the cases that come to the office of the electro-therapeutist who employs cell and coil currents alone.

During the treatment of the cause the headache in most cases is permanently relieved or greatly lessened. This is especially true in the use of the galvanic and faradic currents, but in the use of static electricity practically every treatment is constitutional as well as local, and if headaches are habitual or are present at the time of treatment the same administration that relieves the pain tends to promote the permanent cure.

As there is but very little difference in the form of applications to the head, the separation of headaches into thirty or forty different varieties is of value only so far as it relates to the probable prognosis.

Some headaches will be rapidly relieved by static electrification, and if benefit is maintained by a sufficient course of treatment it will gradually become permanent. These headaches are those which arise from functional disturbances of the nervous and circulatory systems and the pelvic organs and perversions of nutrition.

Some headaches which are a symptom of diseases which are amenable to benefit by static electricity will also undergo gradual improvement while the disease is being treated. The headaches of rheumatism, gout, malaria, and some kinds of dyspepsia belong to this class.

Severe head pains which are due to grave or chronic disease, or pressure within the cranium—causes which the static current cannot directly affect—may often be mitigated in their severity. It is obvious that a very great advantage of static electricity over the "headache powders" now for sale in popular dry-goods stores and on all druggist counters without the formality of a competent physician's advice is the decided general benefit which it imparts whether it palliates or cures, and that in no case is it liable to do any harm whatever. When the anæmic victims of habitual and severe headache resort to "powders," which they buy as common merchandise, and take with twofold ignorance of either the nature or the action of the drug, the consequences may be oftentimes disastrous. It is certain that many people injure their health in this way.

If the patient is receiving other electric treatment and has a headache at the time, the method of relief will be the application of some form of breeze upon the area of pain.

This may be the frontal region, the vertex, one or both sides of the head, or the occiput. If the headache is nervous or con-

gestive, or the scalp feels sore and bruised, or is relieved by cool applications, I consider the positive head breeze indicated, and apply it with the strength regulated to comfort until the headache ceases. This may require five or ten minutes.

If it is a very obstinate ache I have observed that after five or six minutes the sense of relief has only begun to manifest itself and that about double this time will be required for the *séance*. If, however, a state of comfort is not obtained under thirteen or fifteen minutes it has been my experience that the headache was not suited to this remedy. Bilious headaches and those dependent on the dragging of a uterus which needs support are of this character.

If the headache is one which seeks stimulation rather than sedation for relief I employ a negative breeze; but in this case it is much more necessary to employ a hand electrode and keep the breeze in motion if the hair is thick and resisting. A strong negative head breeze from a fixed electrode is wellnigh intolerable to a scalp which is covered with thick hair, but the irritation may be reduced by keeping the electrode in motion or by interrupting the breeze as I have described elsewhere.

Upon the whole, the amount of attention to give headaches—whether to treat them locally or trust to the general treatment; whether to expect temporary relief, partial improvement, or a permanent cure, or whether to disregard electricity entirely and prescribe other measures—is a matter for experience to teach the operator of the static machine, and the ground cannot be fully covered in a text-book.

I have now a case of a woman, about thirty years of age, who simply sits upon the static platform to hold her infant while the child is subjected to positive electrification for about ten minutes three times a week. She lately informed me that she had had habitual headaches since the age of nine, and that she could remember very few days of her whole life when her head

had been entirely free, but she had noticed that she was now free from headache more than half the time, and that her head always felt comfortable for the remainder of the day following each sitting.

The curative tendency of electrification is very marked and very persistent, but there are so many causes of headache which are beyond its reach that a reasonable amount of judgment must be employed in deciding whether to treat locally or not.

Migraine.—Seat the patient comfortably on the negatively insulated static platform. Ground the positive pole to the water pipe or gas fixture. Concentrate a positive head breeze upon the site of pain, regulating the intensity to the state of the patient's head and hair. The space between the head and electrode may usually be from twenty down to twelve inches.

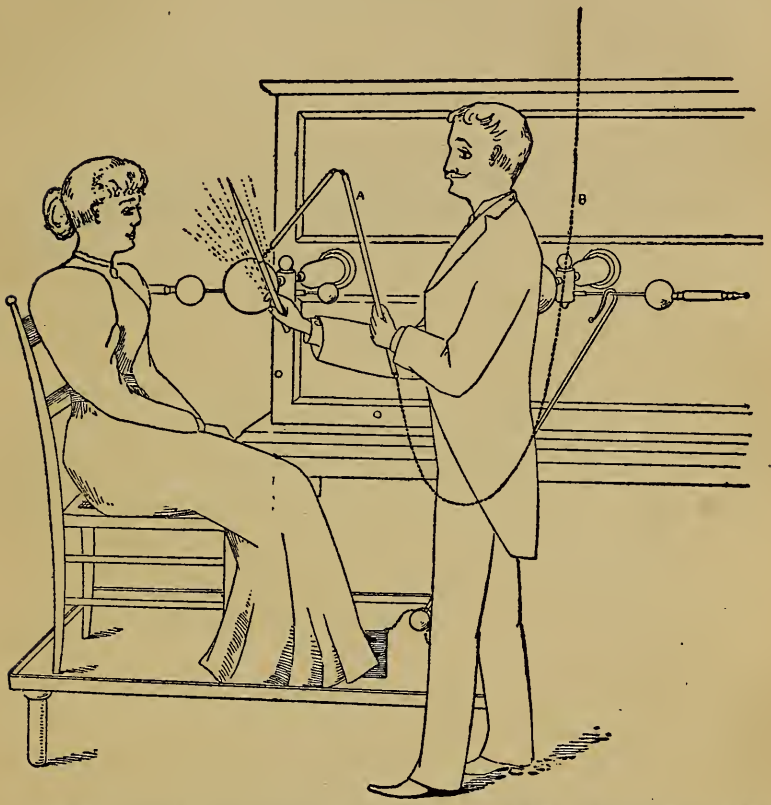
Continue head breeze three minutes after all pain ceases at each *séance*. Then apply a general nutritional treatment to the spine and entire body, with the brass point electrode so manipulated as to cause an agreeable glow throughout the system, tone up the heart action, raise the temperature to normal, and dispose of the cold extremities which these patients so often have.

Close the sitting with a few moments of sedative-tonic positive electrification. The total time required for thorough treatment is rarely over fifteen minutes. Repeat daily at first until relief lasts two days. When improvement is established continue three times a week.

In two or three months, sometimes sooner, relief becomes permanent in the majority of cases. The expert operator can hasten the results by attention to the special idiosyncrasies of each case.

If the constant head breeze is felt to be uncomfortable the point electrode swayed in the hand will make it satisfactory. If the hair is thin, and the clothing is of neutral fabrics, thin or tightly woven, positive electrification may be preferred to

obtain the stronger negative breeze; but in all these cases the choice of poles must be governed by the strength of current given out by the machine.



Static Breeze with Hand Electrode. *A*, Author's electrode-handler insulated with hard rubber; *B*, the terminal chain connected with the gas fixture. The dotted lines were designed by the artist to indicate the movement of the point during application to the frontal region. The electrode should be directed more horizontally towards the patient than is shown in the diagram. Either pole may be connected with the platform and the opposite pole grounded. The principle is the same whether the breeze is applied to the spine, head, or any other portion of the body.

The head breeze may temporarily relieve the pain at the time of the paroxysm, but curative results depend of course upon regular and persistent treatment for several months.

Along with relief from pain there is a general upbuilding of the patient's health, which will remain of great value to her for a long period, and it is this decided constitutional gain which adds a peculiar satisfaction to the use of static electricity in a disease in which drugs so often fail.

If complications exist they must of course receive care, but the treatment of migraine itself by static electricity will rarely disappoint if properly carried out.

The Relation of Common Conditions to Success or Failure in General Electro-Therapeutics.—There are three prevalent conditions which occupy an important relation to electro-therapeutics and call for special remarks. These are anæmia, chronic gastric ill health, and a state popularly known as bilious or malarious.

Electricity holds a subordinate place in their ordinary treatment. In most cases of anæmia the action of iron, arsenic, and other chief drugs administered three times a day is much more rapid and satisfactory than static electricity alone when it is administered but three times a week. Electric currents do not take the place of hæmatic remedies, nor of proper medication for gastric and hepatic derangements, though electricity is certainly not without beneficial action in assisting the functions of the digestive organs. Dependence upon it alone is, however, a cause of disappointment in many cases, and the secret of failure to repeat the results of successful operators is often to be found in a torpid liver or neglected gastro-intestinal complication.

It should, therefore, be the first duty of the physician who is about to employ static electricity by general methods for its tonic or nutritional effects, to combine suitable and necessary medication to put the patient in a state to receive the full benefit of the influence for good that is exerted by electrization upon the nervous system, which in turn will then proceed to improve the whole body.

CHAPTER XXVII.

HOW TO PRODUCE SPECIAL THERAPEUTIC EFFECTS.

Method of obtaining general sedation effects with static electricity. Method of obtaining local sedation with the static breeze. Method of producing general stimulation effects. Varieties of technique. Effects of static stimulation not evanescent like alcohol. Not followed by depressing reaction. Invigorating properties of static electricity due to improvement of nerve and muscle nutrition. Method of producing local stimulation with the static breeze and spark. Special reference to polar selection in local applications. Both positive and negative forms of static breeze may be made sedative or stimulating by the operator. Remarks upon testing the static current for chemical effects which it does not appreciably possess. Counter-irritant applications. Different methods of producing rubefacient effects. Certain forms of application surpass all other methods of producing quick and effective counter-irritation. Nutritional applications of static electricity. Thorough constitutional effects in the treatment of chronic diseases. Muscle-contracting methods. A disruptive discharge required. Massage effects. Special methods described. Electrical and hand massage. Physiological effects of each. Therapeutic effects of each. Advantage of the Holtz apparatus in superseding the ordinary *masseur* in office practice.

WHEN no local application is required and a **general sedative-tonic** effect is sought the patient should be charged positively rather than negatively. The effects, sedative and stimulating, are relative expressions of the same constant and chief action of the static charge as a function-regulator. The effect of regulating a state of circulatory or nervous excitement is called sedative, and the effect of restoring to normal a state of under-activity may be called tonic or stimulating, but both results are the effect of the one regulating tendency of the static current and cannot be produced unless the patient is in the susceptible or opposite state.

The author's method of positive potential alternation acts even more quickly and powerfully as a sedative. I prefer the

positive to the negative charge because I believe it to be more energetic in its action. I do not attribute any chemical difference to the two polarities. As long ago as 1781, and previous to that time, it was fully ascertained that: "by electrization, *whether positive or negative*, the pulse of a person is quickened, the number of pulsations being generally increased about one-sixth; and that glandular secretions and the insensible perspiration are promoted and often restored when they had been entirely obstructed."

I conclude that when a patient is seated upon the static platform and charged from the negative prime conductor the difference of potential between the charge and zero is very much less than the difference of potential between the positive charge and zero.

As the greater difference of potential represents a greater pressure force, and consequently a greater rate of change, I conclude that it is to this extent more effective in accomplishing certain results within the tissues; and as a matter of fact this judgment is corroborated by clinical experience.

Granted that the therapeutic work of both poles is in the same direction, it is evident that the polarity which produces the most active rate of current flow under the conditions of insulation, accumulation, condensation, and atmospheric diffusion will be the most active therapeutically. It is my custom, therefore, to employ the positive pole for general sedative effects in almost all cases.

Local Sedation with the Static Breeze.—To secure this effect in acute local congestions, irritable states, pruritus, dermatitis, tender and swollen joints, acute sprains and injuries, the insulation may be negative, the breeze positive, and the patient should receive the breeze directly upon the uncovered skin of the affected part.

Seat the patient on the negative platform; ground the positive pole and the brass point electrode to the gas fixture or water pipe. With the plates in moderate action keep the point

in gentle movement over and around the affected surface and beyond sparking distance if congestion or inflammation is present, for sparks should not be applied to these states.

The distance at which the electrode should be manœuvred should be such as to produce the most cooling and beneficial effect, and experience must teach this to the operator. Relief is almost instantaneous and is continuous while the breeze is passing, but to be made as permanent as possible the application should continue about double the length of time required to produce a sense of relief after the breeze is stopped.

The length of the *séance* varies in actual practice from five to ten minutes in mild cases to fifteen or even twenty minutes in more severe or very obstinate cases. This form of sedation is applicable to almost any external part of the body, and in addition to being exceedingly useful as a local sedative it produces a general tonic effect upon the entire system.

General Stimulation Effects.—The effects of static application are very much more in the nature of nutritional tonic action than of mere stimulation. I have had patients report to me that their family physician laughed at the idea of their being benefited by static electricity, and told them that it was only a "temporary stimulant like alcohol," and that "a drink of whiskey would do about as much good." The gross ignorance of facts a century old betrayed by such commonplace assertions will apparently never be educated out of the medical profession so long as medical colleges trifle with the great subject of electro-therapeutics.

If a patient is in such a state that what may be called a general stimulation of the circulatory and muscular systems is indicated, it may be obtained in any one of several ways.

A general application of a Leyden-jar current to the surface of the body will do it. Ten or fifteen minutes of simple positive electrification will do it in the mildest degree. A positive breeze to the spine with negative electrification will do it still more perceptibly.

If fusillades of sparks are thrown from the brass point to mingle with the spray application the effect will be still further increased. If the platform is again connected with the positive pole and the spinal breeze applied from a grounded brass point electrode the stimulating effect will be intensified in direct proportion to the power of the current, the proximity of the electrode, and the resistance of the wearing apparel.

If sparks are also discharged with the breeze the rate of change and consequent stimulation will be increased. If the electrode is rubbed over the surface instead of being swayed at a distance, greater or less, the stimulation will pass into a decided counter-irritant effect.

Efficient muscular stimulation is obtained by any application that will contract the muscles. The mild positive spark with negative electrification produces contractions which are proportioned to the spark length and thickness, regulated by increasing or decreasing the revolution of the plates.

With positive electrification the spark from the grounded brass ball electrode discharges the patient with a still greater difference of potential, and the increased voltage gives to the spark more pungent, stinging, penetrating, heating, and stimulating properties.

None of these effects are, however, of the nature of an alcoholic stimulation, which is evanescent and followed by depressing reaction. They are more nearly comparable with the enduring vigor imparted to the tired system by a restful and substantial meal. The great basis of value of static electricity is a nutritional, rather than a merely stimulating effect. No one need remain uninformed of the truths of electrophysiology.

Local Stimulation with the Static Breeze and Spark.—Every localized application of static electricity in any form tends to stimulate the normal function of the part. The action of remedies is to some extent regulated by the existing conditions within the patient. A hypodermic injection of a grain

of morphine would be but a gentle comforter to the victim of a cancer who is habituated to its use in such doses. It would act as a stimulant to restore the normal sense of well-being and cause no effects of narcotism.

The effect of the same administration to a person either sick or well who had never taken a dose of morphine in his life would be of a very contrary nature. To some extent, therefore, the same applications of static electricity which soothe pain, congestion, and inflammation in these overactive states are stimulating to the opposite condition; but the most direct and effective stimulation to any local part is secured by exercising the muscle functions.

What is said above in the remarks upon general stimulation sufficiently covers this ground. I shall, however, dwell for a moment upon the subject of static polarity.

Very confusing ideas are prevalent among physicians on this point; some considering that the choice of poles relates to chemical action, so that they must be as carefully differentiated as when employing the electrolytic action of the opposite galvanic poles; some holding the view that having successfully cured a case by the masterly selection of the proper pole, they would have aggravated the condition if they had employed the other; and some considering the whole matter as hopelessly tangled in confusion and ignorance and yet awaiting the conclusions of scientific inquiry.

These views may all be brushed aside. A careful reading of the chapter on electro-physiology and the actions of different administrations will show that all that need be known on these points was pretty fully ascertained when Cavallo wrote of static electricity one hundred and twenty years ago.

It is universally stated that the positive breeze is sedative and the negative stimulating. By negative breeze is meant the application from a grounded electrode, with the negative pole grounded and the patient connected with the positive prime conductor. For the sake of simplicity, and to avoid mixing up

the teachings upon the subject, this book follows the usual statements in this regard.

As a matter of fact, however, it cannot be repeated too often or made too plain that the nature and effects of all breeze applications with either pole depend a great deal on the operator. I will now state that there is no more sedative application possible with the brass point electrode than the so-called "negative breeze," if I desire to make it so. Far from being "stimulating" and "irritating," it can be made to play like the cool zephyr of an ideal spring upon a heated and painful part, or any part wherein resides an ache or sense of irritation; and the two conditions which are all that are required to produce this most exquisite and refreshing of static sedative applications are non-resistance between the surface of the body and the point of the electrode, save only the air gap; and the reduction of the latter to about two inches—or, if the machine is in rapid motion, three or four inches.

This application, which is so delightful upon the absolutely bare skin, is also exquisitely agreeable through cotton fabrics and some of the lighter materials which ladies wear in the warm season of the year. It is the presence of thick hair upon the scalp and the resistance of woollen or winter garments which alone give rise to the prevailing idea regarding the negative breeze.

Physicians who are just beginning their experience with static electricity and who imagine that polar effects are chemical in their nature, may either read the long-established facts or inform themselves by a few simple experiments.

Polish two pieces of copper wire and attach to the tips of a pair of conducting cords. With a hard-boiled egg, a piece of raw beef, and three small dishes, one containing a ten-per-cent solution of salt, a second a ten-per-cent solution of iodide of potassium in starch, and a third plain water, determine what chemical effects really follow when the pieces of copper wire are in turn thrust into the egg, then into the beef, and then into

each of the solutions, and a continuous galvanic current of any given amperage passed for any desired length of time.

The copper wire should be polished between each experiment, and, beginning with a large current which will produce immediate chemical effects, the physician should reduce the current to discover how small a number of milliamperes is required to permit a brightly polished positive copper needle to remain in a hard-boiled egg for one hour without causing the slightest green discoloration.

Having obtained in this manner some idea of what takes place, repeat the same experiments with the static current. No further argument will be required.

Counter-Irritant Applications. — Local counter-irritation may be effectively applied with superficial and reflex effects by the static operator. It is one of the best, if not the very best, means of influencing the deeper tissues through the cuticle; and it acts almost instantaneously.

Its reflex actions are all the more pronounced because of the fact that every local application is accompanied by an impression for good upon the general system.

Local applications made with the low-potential pole connected with the platform involve a reduced voltage and are therefore less rubefacient in their effects. Those made with the pole of higher voltage effect a much more rapid rate of change and are therefore more intense and can be made more effectively counter-irritant. The principle being exactly the same whether the patient is insulated with the negative or the positive pole, I shall consider only the latter.

Seat or stand the patient upon the static platform with direct metallic connection to the positive pole. Any and all electrodes may be employed and the effect of each is modified (if it is wood) because it is a poor conductor, and increased (if it is metal) by its better-conducting properties, and by its size, shape, and method of manipulation.

The electrode selected is grounded to the gas fixture along

with the negative pole. Start the machine into action. The spine, joint, or local area to be treated should be covered with fabric of texture which will resist the current, such as coarsely woven woollen goods, mohair, silk, etc. If the patient is not so clothed it is a simple matter to throw a piece of fabric kept for this purpose over the part.

I will first refer to the use of the brass point electrode. With the machine in fairly rapid action throw upon the part a succession of showers of needle spray. If the electrode is rapidly withdrawn to some distance, and is swept up and down, or thrown toward the part only at intervals which permit intercurrent relief from the sharp sensation, the application is acceptable to the patient's tolerance.

It can be made more vigorous or milder by increasing or reducing the speed of the machine, and by concentrating or diffusing the spray. The sharp, biting discharge should not be continuously forced upon the tissues by holding the electrode still and at a short distance. Two or three minutes suffice to obtain the desired effects.

In employing the grounded brass point electrode with positive high-potential electrification the operator should personally become acquainted with the differences in sensation, stimulation, and irritation produced by throwing the point directly toward the tissues, by short strokes up and down or from side to side, by long sweeping strokes, by rapid and slower movements, and by holding the point still, at greater or less distances.

Manipulation alters the effect and there is a good deal of knack about it. The addition of volleys of sparks thrown like a fiery trail in the wake of the spray intensifies the effect.

The usual sparks with negative electrification are also counter-irritant, but in a much milder degree than sparks applied in the following manner:

Connect the platform with the positive pole, and ground the negative pole and brass ball electrode or massage roller or even

the brass point to the same gas fixture. Any electrode with a metal surface may be employed. With the machine in mild, or medium, or rapid action, according to the intensity of the heating and rubefacient effects desired, quickly advance the electrode to contact with the surface of the body and rub it over the clothing with rapid passes, maintained only for the brief time that the patient can endure the biting sensation, and then withdraw the electrode.

These hot and irritant frictions can be repeated a number of times within a couple of minutes.

The long splitting, stinging spark with the electrode connected to the negative pole while the patient is electrified positively is also powerfully counter-irritant as well as muscle-contracting.

The uses of these several means of producing counter-irritation cannot be itemized here. The practical physician will recognize when such effects will be appropriate to a given case, and it is only necessary to have in mind the technique of grading local action.

Vesication can, of course, be produced by simply pushing the application to intenser effects, but he who makes much use of static electricity soon learns to prefer milder measures and practically abandons vesication, blisters, cupping, and similar procedures which are more annoying to the patient and vastly less efficacious than the simple and beautiful resources of electro-therapeutics.

Nutritional Applications.—When the chief aim of the static administrations is to promote the general nutrition a useful starting-point is made by every form of either local or general treatment that can be applied. However, general positive electrification produces a more active rate of change within the tissues than general negative electrification, because its voltage is higher and it more readily overcomes the resistance of the insulating atmosphere and diffuses out of the patient with greater energy.

Any form of local application that is familiarly employed to improve the functions and nutrition of a part can be extended over the general surface of the body to improve the functions and nutrition of the whole system.

The static-cage application and potential alternation are excellent nutritional methods. In many cases we are content to add to general positive electrification a localized breeze upon the great nerve centres of the head and spine which influence the functions of the body.

In other cases of chronic disease with lessened sensitiveness and great tolerance of the spark I depend for the best nutritional effects upon three or four minutes spent at the close of the sitting in the application of medium sparks up and down the spine, over the great organs of the trunk and the muscle groups of the extremities, in fact to the general surface of the body below the head.

Muscle-Contracting Methods.—It requires some form of disruptive discharge or interruption of the static current to produce a muscular contraction. Leyden-jar currents with either rapid or slow interruption represent for this purpose the equivalent of induction-coil currents.

Static sparks of every degree contract muscles to which they are applied, and most powerfully so when they strike the motor point. The massage roller contracts the muscles over which it is passed. An additional method consists in having the patient hold an electrode by its hard-rubber handle and press the metallic end upon the part to be treated. With the brass ball electrode the operator applies a slow succession of sparks to any portion of the metallic surface of the electrode held by the patient. This does away with the sting of the spark directly upon the tissues, and is available in some regions whose anatomy is not adapted to sparks in the usual way, and especially if the patient is sensitive.

When a hand or arm is the part to be treated, a chain may be wound around the upper arm, or forearm, or hand, and

hooked upon either pole of the machine, serving as the platform connection. The other pole is grounded, and with the grounded brass ball electrode slow interruptions of the current are produced by sparks between the electrodes and the prime conductor to which the chain is attached. If this is the negative pole, the current will be less vigorous and the contractions milder than if it is the positive pole. The vigor of the contractions is also regulated by the speed of the machine.

If the hand is immersed in a jar of water, and connected with the prime conductor of the machine by dropping the tip of an ordinary cord into the water, the sparks upon either the sliding pole of the machine or any part of the patient's body will exercise the arm from the finger-tips to the shoulder.

Massage, Electrical and Hand.—In some degree every form of electrical application with an interrupted current which produces a muscular contraction is massage. The muscular contraction of the static spark constitutes a very powerful form of massage.

The application of the roller electrode is so similar in principle to massage that it has long been called the massage roller. The application of Leyden-jar currents to the surface of the body as in general faradization constitutes a very thorough and efficient form of massage.

Rapidly interrupted high-potential currents produce a vibratory action within the tissues for which there is no counterpart in manual massage, and the author's method of potential alternation involves a fine bombardment of the nervous system of a kind and degree which the hand of the masseur is inadequate to produce.

The effects of massage are local and systemic. The physiological effects are succinctly stated by Bartholow: "The masseur puts forth more or less muscular power, which at the points of friction develop another mode of motion—heat. The action thus induced in the tissues elevates the temperature; the vessels dilate and an increased quantity of blood enters them,

and the motion of the blood current is accelerated. The immediate effects of these changes is to promote the nutritive energy of the tissues subjected to friction. This result is seen in the improved color, warmth, and volume of the parts. A general rise of temperature averaging about one degree takes place quite uniformly. The body increases in weight; all the organic functions are performed with more energy, and power is gained in every way.

"Massage in its several forms exercises peculiar effects on the nervous system. When an inflamed part, such as a joint which can be manipulated, is rubbed with excessive gentleness, the sensibility, which was at first so acute that every touch gave pain, readily subsides, until, after an hour of friction, it may be handled with some roughness without evoking painful sensation. The state of spasm of a muscle is relieved and relaxation induced by persevering rubbing of the affected muscle.

"Therapeutically massage is employed in wakefulness and nocturnal restlessness, simple headache, neuralgia, hemicrania, migraine, spinal pain, paralysis, progressive muscular atrophy, chronic joint affections, synovitis, contractions and deformities, thickening from inflammatory deposits, neurasthenia, anæmia, hysteria, constipation, rheumatism, etc."

While speaking of the extraordinary utility of massage in certain cases Bartholow also states that "patient and long-continued use of the method may often be required."

The confidence of the medical profession in massage is very great. It is in good repute among the laity. Its merits are usually set forth by those who pursue the vocation of rubbing people in about the following manner:

Massage is a scientific mode of systematic manipulations upon the nude skin of the human body in a passive condition. It includes percussion, friction, kneading of the muscles, exercising the joints. The physiological effects of massage include the incitement of the nerve centres, a healthy rise of temperature, acceleration of the blood current to the arterioles, promotion of constructive metamorphosis and the nutrition of tissues; also destructive metamorphosis,

excretion of waste substances and a general increase of muscular force.

Its effects upon the nervous system are soothing; and by skilful, gentle manipulation the acutest pains gradually depart. Under the treatment of a scientific operator morbid mental states give place to hope and cheerfulness and all the functions of the body are performed with increased energy, causing those benefited by massage to say: "*Life is worth living.*" The most eminent physicians in Europe and in America give massage a prominent place among topical health-restoring agents and highly recommend it as a valuable therapeutic auxiliary. Therapeutically massage is beneficial in the treatment of . . . and similar diseases.

Sufferers from obesity have been greatly benefited and their weight reduced by massage. For weak and sickly children also suffering from infantile paralysis massage is the best topical remedial agent. Persons who are free from organic or symptomatic disease, but are deprived of outdoor exercise, including clergymen, lawyers, and all whose brains are overtaxed will find the soothing manipulations of a skilful operator a mental and physical luxury.

No one who will study the physiological action and witness the therapeutic effects of galvanic, faradic, and static currents of electricity, in the great variety of local and general methods by which they may be administered, with their wide range of exact dose regulation, will fail to see that every demonstrated influence of massage upon the human tissues is included within the compass of electro-therapeutics; and the skilled operator with fine apparatus can so far surpass the manipulations of the hand that all that can be claimed for massage simply demonstrates the superiority of electric current action.

Referring especially to the ordinary applications of static electricity for exactly the same long list of diseased conditions for which massage is recommended, it may be said of massage that it is not usually performed by the physician, but involves putting the patient into the hands of a third party, who is often destitute of medical education, but who fills the ear of the patient with attractive stories and takes all of his money that he can get. On the part of the patient it involves disrobing, and the sacrifice of about an hour's time for each *séance*, and the

development of effects by a slow and tedious process. In the case of pain and acute inflammation of a joint a good operator will succeed slowly at best, while a poor operator can easily make matters worse.

The applications of static electricity are made by the physician himself. He keeps his patient in his own charge without outside interference. The patient is not required to disrobe, and the treatment occupies only from five to fifteen minutes.

Symptomatic relief, especially relief from pain, is obtained in a manner as much superior to the processes of massage as the electric light is ahead of the old wax candle.

Massage cannot by any possibility do any good to the patient that static electricity cannot equal or surpass.

Static electricity can do much for many patients that no *masseur* has ever dreamed of accomplishing. However, it is equally true of both massage and the static machine, that each requires an experienced and competent operator; and if the patient is confined to his room and is neither able to visit the physician's office nor enter a well-equipped sanitarium, the *masseur* can reach him and do him good while the static machine cannot.*

* Much of the best electro-therapeutic work in medical practice depends upon non-portable apparatus for its accomplishment. Physicians and surgeons who are completely equipped with improved static, galvanic, and high-tension induction-coil apparatus will do much to extend their usefulness by receiving patients into their residence if they are not in sanitarium work. In this way many cases may obtain the benefits of frequent and thorough treatment who would otherwise be deprived of relief. This has been the author's practice for a number of years and possesses advantages in favor of both the medical attendant and the invalid. I am certain that in some of my cases more benefit has been given them in a month by having them in my house than they could have obtained in six months by attempts at even similar treatment if daily journeys to and from the office had been undertaken.

CHAPTER XXVIII.

DISEASES OF THE SKIN.

The place of static electricity in their treatment. Its value for the relief of symptoms and to promote nutrition. The importance of improving the general health in the treatment of skin diseases. The relief of itching, burning, and painful symptoms by static electricity. The class of cases to which it is suited. Falling of the hair from debility or defective nutrition of the scalp. Method of treatment. Effects. Alopecia. Indications for static electricity found in the constitutional state of the patient. Local and general benefits of electrification. Acne. Static electricity useful to promote systemic nutrition. Its influence upon the causes of acne. An efficient auxiliary aid to treatment. Local anæsthesias. Anhidrosis. Carbuncle. A clinical case. Dermatalgia. Static electricity relieves the symptom and treats the cause. Dermatitis. Beneficial action of the sedative breeze in acute inflammations of the skin. Eczema. Symptoms and causes indicate static electricity. Principles of successful treatment of eczema with static electricity. Elephantiasis. Probable relief of symptoms by static sparks. Epithelioma. Temporary relief of pain by the static breeze. Erysipelas.

STATIC electricity is not a panacea for cutaneous affections and probably the dermatologist would be one of the last men in medicine to consider a static machine as part of his office equipment.

But for the general practitioner who is called upon to treat a great many of the simpler and more curable cases it is worth while to consider how he may employ an apparatus for which he has paid a large sum and which will render him and his patients services of very great value.

Static electricity cannot take the place of cleanliness, the evacuation of pus, surgical measures, mercury, sulphur, carbolic acid, etc., but it is useful for the relief of some symptoms and to promote the general and local health.

One of the most practical recent writers upon dermatology says:

> Every patient should be regarded as out of health in some way quite apart from his skin trouble, and examined as to the performance of all his functions quite as carefully as if he had come to you for the treatment of some internal disorder.

The same writer also says in regard to new remedies, some of which appear nearly every month, that

> careful comparative tests demonstrate that many of them are no better than the old and tried ones. It is better for the general practitioner to learn how to use a few drugs than to try every new thing.
>
> By practical experience he will be surprised to see how much he can accomplish with a very small assortment of drugs. The greatest secret in the treatment of eczema and many other skin diseases is not what particular drug or formula is good for the disease, but a knowledge of the great principle that acute diseases need soothing remedies, and subacute and chronic diseases need stimulation.

If the physician will turn from this statement by a very competent dermatologist and read afresh the chapter of this book which describes the local and general sedative, tonic, stimulating, counter-irritant, and nutritional action of the different forms of static administration, it will appear plain that this agent is a substitute for some part of the routine treatment of skin diseases in a great many cases, and that in some cases it will produce benefits to the patient which cannot be obtained so well in any other way.

For the relief of itching, burning, and painful symptoms it surpasses any palliative known to me, and I have tested a very large number.

If we consider skin diseases without the myriad subdivisions which enter into the description and diagnosis in classical works on this subject, and regard them as either functional or organic, and apply principles of treatment with regard both to the cause and the pathology of the lesion, and still further eliminate the lesions which fill the pages of literature but are

rarely seen in private practice, we get down to a working basis for the application of static electricity.

In the following remarks I have drawn freely from the writings of Dr. George Thomas Jackson, who in turn acknowledges his indebtedness to Crocker, Fox, and other leading workers in the field of modern dermatology.

Falling of the Hair from Debility or Defective Nutrition of the Scalp.—Seat the patient upon the static platform in the usual manner, and if the hair is thin and the current is not irritating, or if the irritation can be satisfactorily removed by interrupting the breeze, apply a strong negative head breeze for about ten minutes every second day.

The platform should be connected with the positive pole, and the grounding chain attached at the same time both to the negative pole and to the breeze electrode.

If there is some soreness of the scalp, or if the hair is thick, or if for any other reason the application must be made milder out of regard for the comfort of the patient, the head breeze must be connected with the positive pole and the platform to the negative.

If the patient's health is below par other tonic applications to the spine and general surface may be applied as indicated.

It is a matter of common observation that patients undergoing a course of treatment with static electricity for some other chronic affection notice that their hair ceases to fall out, and as the general nutrition improves in a couple of months' time the nutrition of the scalp has also been improved.

Clinical Remarks.—Dandruff is said to be the most frequent cause of premature baldness, and dyspepsia is not only one of the most common diseases but is probably also one of the most common explanations of the loss of hair. The nutrition and proper blood supply of the vital organs is the first consideration of nature. When she cannot command a sufficient quantity of circulating nutrition for all parts of the body she retrenches at

the extremities and cuts off the supply first from parts which are the least vital, like the hair and the nails.

The reader who studies the effects of static electricity upon the general circulation and nutrition will note that it is definitely indicated in these cases.

Alopecia.—Some forms of this condition are far beyond the reach of any remedy, and others are amenable to specific medication, but the neuralgic pains of alopecia areata may be relieved by the static breeze, and the fact that the disease has a strong tendency to spontaneous recovery in the course of time would suggest the probability that static applications might aid nature a good deal; especially when the patients are "of a very nervous temperament, exhausted by overwork or nervous strain, or are out of health in some way."

If the neurotic theory of the disease is correct it would be an additional reason for employing electricity. Jackson especially says: "One duty we have without peradventure, and that is, to look after the general condition of the patient. A large number of the cases require a stimulating and tonic treatment —iron, quinine, strychnine, arsenic, cod-liver oil, or hypophosphites. Children should be allowed to run free and taken out of school. Our hardest task will be to manage those nervous patients who are ever a trouble to us." This certainly calls for static electricity with a loud voice.

This is apart from the local treatment, which is summed up in two words, "patience and stimulation"; but the general indications for static electricity could not be more clearly stated than they are stated above by the dermatologist who had no thought of such an agent in his mind.

The nervous patients who are ever a trouble to the dermatologist are particularly amenable to relief by skilful static administrations, which are as welcome to them as shade to the traveller in the desert.

Acne.—In these cases static electricity may be useful to

promote the systemic nutrition of the patient rather than locally to treat the sebaceous glands.

It may be stated as a broad general rule that anything which lowers the general health of the patient contributes to the production of acne. Thus, we have the vague state "general debility," anæmia and chlorosis, oxaluria and uræmia, rheumatism and gout, poor circulation, bad personal hygiene, mental and physical exhaustion, and chronic malaria, cited as causes by writers upon dermatology.

These are all the particular conditions which general static electrification influences favorably, as may be seen by reference to the chapter on its physiology.

Of treatment Jackson says: "In the treatment of acne we can obtain a cure most surely by attention to the general condition of the patient; most rapidly by a combination of internal and local treatment; and we should therefore begin the treatment of a case by careful inquiry into the general condition of the patient, and endeavor to regulate any, even the slightest, derangement of the internal organs."

The thorough treatment of these cases therefore involves the local measures usually employed, the regulation of diet and hygiene, and the application of the principles of general medicine to the relief of constitutional disorders.

Static electricity will be found an efficient aid to the constitutional part of the treatment.

Anæsthesia.—This is a loss of sensation in the skin which occurs in a number of diseases of the nervous system, notably in hysterical affections. It may be general or partial, and is probably more successfully treated by static stimulation of the sensory nerves with either short friction sparks or long sparks than by any other means.

Anhidrosis.—This symptom may be local or general, and depend upon a number of causes, but when it is neurotic the restoration of the function of the sweat glands is directly in line with the physiological actions of static electricity.

The usual treatment recommended is "tonic exercise and bathing," and it is evident that the capabilities of static electricity far surpass either of these measures. It can be added to them with good effect.

Carbuncle.—Apart from surgical measures Jackson says: "As the disease is an exhausting one, the patient's strength is to be supported from the start, and his nutrition kept up by a generous diet. Fresh air by good ventilation must be secured. If the pain is excessive, opium or morphine is indicated especially to secure sleep. Iron is a valuable remedy all the way through, and quinine or antipyrin if the fever is marked. Alcohol should be given if suppuration is free, especially if there are any signs of exhaustion."

The author has had no experience in the treatment of carbuncle by static electricity as a supplementary measure, but the following case was reported by Harper in April, 1893:

On November 10th last a gentleman called at my office suffering greatly from effects of a carbuncle at least three inches in diameter and thoroughly honeycombed, on the side of his neck. During several nights he had not been able to sleep.

I at once made a crucial incision to the full extent and depth of the morbid mass, and then applied a static breeze which favored the free flow of pus and relieved all pain.

The following day the patient asserted that he had slept all night, had a good appetite, and had not suffered a twinge of pain since he left my office.

On the fourth day, with the aid of small forceps, I drew out all morbid material, which was of so firm a character that some pieces were one and one-half inches long and it was necessary to cut them loose from the bottom.

On the following day it occurred to me that I might bring about adhesion of the four flaps instead of allowing them to slough away. Accordingly, I strapped them down tight and drew sparks from the surface.

On the next day half their extent was adherent, and in twenty-four hours more full adhesion had taken place, leaving only a scar as from an ordinary incision.

The patient never lost a meal from the time of his first treat-

ment, could lie sleeping on the affected side, and had no recurrence of any pain whatever. Having heretofore seen severe and prolonged suffering from carbuncles, I desire to report the results in the above case.

Dermatalgia.—This neurosis may disappear of itself "after weeks or months." The pain is variously described by patients as boring, pricking, or burning; or numbness or coldness may be complained of. It may be constant or intermittent in character and is sometimes so severe as to be agonizing. The symptomatic form occurs in locomotor ataxia, rheumatism, syphilis, malaria, diabetes, hysteria, chlorosis, and about the menopause.

Treatment: "If we can remove the underlying cause we can cure the trouble, so our remedies should be first addressed to it. Unfortunately, for some of the diseases of which dermatalgia is a symptom we can do little. In any case, the patient demands some local treatment to relieve the pain."

Of the score of remedies suggested by the writer of the above paragraph every one of them is distinctly inferior to the best and simplest remedy which he does not name.

The capabilities of relief by static applications varying from the positive or negative breeze to the spray and spark, according to the situation and extent of the dermatalgia, not only include the immediate cessation of pain at the first sitting, which lasts for a longer and longer time as the sittings are repeated until in many cases it becomes reasonably permanent, or in incurable cases is reasonably palliated, but far beyond the affected area of the skin the reflex and constitutional benefits of static electrification exercise a beneficial influence upon almost every one of the important diseases of which the pain is symptomatic.

Whatever special medications may be indicated by the presence of rheumatism, syphilis, malaria, diabetes, and chlorosis, it is certain that static electricity will increase the benefit they produce upon the general system, and it is the most effectual

local remedy that can be applied to the site of pain. Daily and long sittings are advisable if the case is stubborn, and more dependence should be placed on the negative breeze than on sparks.

Dermatitis.—While nearly every case of dermatitis will naturally be treated by ordinary methods, yet it has occurred in my own experience that on the first visit of the patient to the office and before applying any local dressing, it has been worth while to treat the part with a sedative static breeze.

By this means the relief of pain is instantaneous while the breeze is passing, swelling is reduced, the intensity of the inflammation is lessened, and severer symptoms are cut short. In fact the comfort of patients has been so agreeably promoted that they have expressed very lively appreciation.

One advantage in addition is the abatement of constitutional disturbances through the sedative and restorative action of the general electrification upon which the breeze is engrafted. In later stages when itching is a marked feature the breeze also relieves this. It must be applied upon the bare skin.

In the many forms of chronic dermatitis the static breeze will be found an excellent palliative to the symptoms and an effective means of applying local sedation or stimulation, whichever may be needed.

Eczema.—It has been said that the physician who learns to recognize and treat syphilis and eczema has in his possession the key to the whole of dermatology.

There are six prominent symptoms of this inflammatory and frequent skin disease: redness, itching, infiltration, tendency to moisture, crusting or scaling, and cracking of the skin. The subjective symptoms are itching, burning, and a feeling of heat and tension.

About twenty-five varieties of eczema are described. Some of them last a few years and some of them last forever, with occasional vacations.

Of the predisposing causes the most universal and active is

some disturbance of digestion, constipation, malassimilation, perverted nutrition, derangement of the liver. At other times the kidneys are at fault. Diabetes and Bright's disease both predispose to eczema. Chlorosis and anæmia, uterine disorders and the menopause, and the strumous diathesis are at times active factors. Derangements of the nervous system are exciting causes; now and again we will meet with cases which appear suddenly after some nervous shock. Rheumatism and gout and varicose veins are other predisposing causes.

To most of these internal causes some external cause must be added before the eczema appears, and the external irritants are about the same things which will cause a dermatitis, "only the action goes further and a catarrhal condition results."

As this is the dermatosis which the practitioner is most often called upon to treat, and as chronic cases are exceedingly stubborn and return again and again after temporary "cures," and the remedies are countless, it is well to have in mind a condensed synopsis of the chief principles of treatment.

Regarding the patient as a sick man it is obvious that constitutional measures which will improve the powers of nutrition, correct disease, and regulate functions are indicated.

Whatever else may be prescribed for the general condition, there is no internal prescription which will "cure eczema," but there are two measures supplementary to diet, hygiene, and indicated medication which are of very great value. These measures are the most nearly curative of any known to the writer, and the *rationale* of their action can better be appreciated by first reading a description of the causes of eczema and then reading the physiological effects of the galvanic and static currents.

I believe central galvanization to be the nearest approach to the best single constitutional remedy that can be employed, but the nutritional properties of general static electrification are also of considerable value.

It is, however, as a local relief to the itching and other

symptoms and as a means of applying local sedation or stimulation, whichever may be needed, that static electricity possesses a very great value as an auxiliary to central galvanization.

The principles of local treatment laid down by writers are: "In acute cases employ soothing remedies; in subacute cases use astringent and slightly stimulating remedies; in chronic cases stimulate; in all cases protect the skin from external irritation."

The use of water is generally advised only in chronic cases, and in such cases I have obtained the best results by making the galvanic application within an electro-thermal bath cabinet, after which I have made the static administrations at the same sitting.

It should also be noted that while there are numerous conditions presented by patients with chronic eczema which seem to call for special medication, yet it has been my fortune to have patients give a history of long medical treatment with no practical benefit, and when I have treated them with galvanic and static currents and simple external measures for protection from irritation they have become quite comfortable in a short time and have progressed to an improvement directly in proportion to their perseverance in treatment.

Some have simply got better and stopped treatment, and some have continued longer and got more nearly well. In an ordinary case twenty treatments will produce results that would require a course of thirty or forty applications in a more obstinate or complicated condition.

In very simple and recent cases which present only a catarrhal condition, the local application of a spray mingled with fine sparks from the brass point electrode is often entirely adequate.

Elephantiasis.—This chronic disease is characterized by hyperplasia of the skin and subcutaneous tissues, due to a stoppage of the lymphatics, affecting chiefly the lower extremities, and marked by enormous enlargement of the affected part.

While the writer has of course had no opportunity actually to test the effects of static electricity upon this condition, yet it must occur to all who are familiar with the effects of static sparks that they would relieve the sense of weight, pressure, pain, and other symptoms with which the patient might be affected.

It is by no means necessary to estimate the remote possibilities of a cure in order to consider static electricity as likely to give relief to some part of the trouble and greatly promote the comfort of the patient.

Epithelioma.—The only possible utility of static electricity in cases of epithelioma might be the relief of the sharp pain which is sometimes present by the positive spray, either before or after operative measures.

Erysipelas.—If the patient is first seen at an office visit the subjective symptoms of burning, tingling, itching, tension, and pain may be greatly relieved in ten minutes by the application of a positive static spray and the patient may then be sent home with a greater degree of comfort than could be obtained by any other means. After appropriate treatment the period of convalescence may be shortened and renewed strength very quickly established by a few office visits for further tonic administrations of positive electrification and spray to the spine.

CHAPTER XXIX.

DISEASES OF THE SKIN, CONTINUED.

Boils and persistent furunculosis. Curative effects of static treatment. Herpes and herpes zoster. Value of static sedation in acute stage. Relief of burning, itching, and neuralgia. Value of static electricity in chronic and debilitated cases. Hyperæsthesia. A clinical case treated with static electricity. Hyperidrosis of the feet. Leucoderma. Negative results of treatment. Lupus. Indications for the general nutritional effects of static electricity after surgical measures. Pruritus. Static electricity the most successful remedy. Report of cases. Method of treatment. Psoriasis. Static electricity to improve the nutrition of the patient. Scrofuloderma. Indications for static electricity as an adjunct to medical treatment. Dandruff best treated by the static head-breeze. Varicose ulcers. Improvement of local nutrition by static sparks. Tenderness of the scalp. Chronic urticaria. Relief of itching and constitutional improvement. Remarks upon the general usefulness and limitations of static electricity in the treatment of cutaneous affections.

Boils.—In the case of the ordinary single acute boil for which local treatment is efficient, the only application of static electricity would be the sedation of pain by the positive breeze if circumstances made it convenient to employ it. The spark would also promote resolution if there was some induration after the discharge of pus.

My experience refers more particularly to the repeated crops of small boils which constitute the condition known as furunculosis.

Seat the patient upon the static platform connected with the negative pole of the apparatus, ground the positive pole and the brass ball electrode. With the machine in slow action apply a few single thick but mild sparks upon each individual lesion.

If it is a blind boil with no tendency to suppuration the

mass will be dispersed in a few days and may not need more than a single application. In such of the other *foci* as show a more acute inflammation the process of suppuration will be hastened.

These crops of boils are the kind which persist for months or even years if left untreated, and are often very obstinate under any kind of medical treatment. It is suggested that diabetes mellitus may sometimes be the cause, and of course if this disease exists it should receive attention. One of the best aids to diet and the usual treatment of diabetes is static electricity, but mild static sparks will dispose of these crops of boils in short order and without much apparent regard to the particular cause.

If the patient's general health is below par it would be advisable to continue nutritional static treatment for several weeks if it was needed, but the local symptom of deranged health will disappear promptly under the local sparks.

Herpes and Herpes Zoster.—The varieties of herpetic inflammations of the skin are marked by burning, stinging, or itching in the part and in the case of shingles by neuralgic pain in the nerve along whose course the eruption is about to appear.

The value of static electricity in these cases is found in the very great relief which the positive breeze and mild spark afford to the symptomatic disturbances.

In a severe case of herpes zoster the sedative application would need to be repeated daily during the period of greatest pain. I have seen patients express great satisfaction with the comfort afforded by static electricity, but do not know that it has any direct effect upon the course of the lesion in recent and favorable cases. It certainly, however, is a great benefit in old and debilitated cases and when recovery is not progressing as it should.

Hyperæsthesia.—The following case of chronic cutaneous

hyperæsthesia was reported by the author in the *Medical Record* for November 18th, 1893:

W. J——, male, aged 62. The disordered sensation was limited to the trunk of the body, his upper and lower extremities being entirely free. It had annoyed him persistently for thirty years, and during the past eight or ten years it had forced him to undress and retire to bed about 4 P.M. daily, as the weight and contact of his clothes, which could be worn comfortably on rising, became by that time unendurable. In other respects he was usually able to attend to business, although he was anæmic, dyspeptic, and subject to occasional paroxysms of sciatica of a very severe type. Firm pressure was fully tolerated upon any part of the body, but slight contact or a current of cold air caused an extreme aggravation.

This condition pursued the even tenor of its way undisturbed by season, climate, diet, constitutional state, outward applications, or internal remedies. I devoted more than a year to attempts to relieve him by drugs, but with no better fortune than my numerous medical predecessors from whom I had inherited the case.

He finally decided to accept electro-therapeutics and static electricity was then employed. Its effect was grateful. He was given general positive electrification for ten minutes, followed by a spray from the brass point electrode to every part of the surface of the trunk, followed by a thorough nutritional application of mild sparks to the spine and extremities.

In a week he was remaining dressed until seven or eight o'clock in the evening. In two weeks the relief was such that he was no longer compelled to retire before the usual hour.

He continued this treatment for a month and a half, during which he received twelve treatments at my office and then left the city for the summer. I was afterward informed that his improvement continued and that he had a satisfactory degree of comfort, but considered that he should have received more than double the amount of treatment before desisting.

Hyperidrosis of the Feet.—When this symptom is reported by patients who are undergoing a course of static treatment I am in the habit of applying mild sparks to the feet, and as a rule these patients also have sparks to the spine and nerve centres. No special effect upon the sweating is usually noticed. If there is any improvement at all it is slow and gradual.

Jackson says that local treatment in many of these cases is as unsatisfactory as the constitutional treatment. Some of the local measures employed are undoubtedly detrimental to the health of the patient, but static electricity can do no possible harm even if it fails to yield any brilliant results. There is a remedy called silica which has cured more of these cases for me than anything else I have ever tried.

Leucoderma.—This consists in a disappearance of the pigment of the skin in circumscribed round or oval patches so that white areas are formed. It is probably a disturbance of nutrition. I am unable to discover that dermatology offers anything in the way of treatment. During the past winter I treated a case experimentally about three times a week for two months with negative results.

The application was negative electrification with needle sparks from the brass point electrode over the patches. The patient had experienced a partial sunstroke prior to the appearance of the spots, which had begun to be noticed about four years ago. At the time of coming to me her health was in a generally depraved state and she was not a very hopeful subject.

Lupus.—"As lupus is a tuberculous disease and sometimes is followed by tuberculosis of the lungs, care must be given to the general health of the patient and he must be placed in the best possible hygienic surroundings. His diet should be nutritious, and cod-liver oil, iron, and iodine should be given. But external treatment is of the greatest importance and the disease must be gotten rid of root and branch."

The indications for the general tonic nutritional effects of static electricity after the surgical treatment of lupus are sufficiently set forth in the above extract. Static will do good service here.

Pruritus.—Itching of the skin is a symptom common to a great variety of cutaneous affections and it is more or less permanently relieved by the positive or negative spray applied directly upon the uncovered skin. When the functional neu-

rosis called pruritus is encountered by the owner of the static machine, he can relieve it in about the same way.

No one with any medical experience requires any information about the ability of pruritus to render the patient's life unendurable and tempt him to suicide. It is one of the most accursed affections that can afflict a man who to all appearances is entirely well and able to attend to business.

There are two important facts about pruritus occurring as an idiopathic affection. One is that every remedy, either local or general, recommended in every text-book on dermatology, is liable to disappoint the patient and afford him either only temporary relief or none. The second fact is that static electricity will palliate the condition almost as certainly as lotions and ointments will not. The victim of this neurosis may start out with the hope of obtaining a cure, but he will in time learn to be exceedingly grateful for even a palliative that will make his burden endurable.

Leloir (1894) reports as follows:

> During the last two years I have employed the static current with the most unexpected results in about twenty-five cases of localized or general pruritus, the more tenacious of which had resisted all treatment. A good number of cases of the extremities, vulva, and anus were cured after a variable number of applications. The eczematous or lichenoid condition secondary to the pruritus disappeared.
>
> In a certain number of cases the pruritus was relieved considerably but did not entirely disappear. In some cases the pruritus resisted all treatment.
>
> I have obtained analogous results in the treatment of generalized pruritus, but the results have not been so good as in localized cases. This method is of great service in rebellious cases of cutaneous pruritus.

My own experience in the treatment of this affection began with a case of inveterate pruritus of the scrotum in the summer of 1893. Whatever may be the part affected, the principle of the static application is the same.

Seat the patient upon the platform connected with the nega-

tive pole of the machine, ground the positive pole and the brass point electrode. The part must be exposed to the skin for treatment and the best effects will not be obtained if the spray is applied through the clothing.

Start the machine into moderate action and sweep the point near enough to the part to produce a luminous discharge of the spray. Gradually intersperse with the spray a few sparks and repeat them at momentary intervals. The spark must be applied with sufficient vigor to set up considerable irritation and reflex action, and for the moment may intensely aggravate the itching. After about three minutes devoted to this part of the treatment proceed to secure the utmost sedation possible by the application of the positive spray without any disruptive discharges. Persist in the soothing spray for about ten minutes.

Treatment may be repeated with reference to the urgency of the case. After some improvement is effected three times a week until benefit ceases will be sufficient, and if temporary aggravations recur in the future the same method will again be satisfactory.

In very annoying and obstinate cases of pruritus of the anal mucous membrane the static application cannot be so well applied, nor with such marked relief as in more convenient situations, and these may be treated by light applications of cupric electrolysis or the cautery, or any other method that will do any good.

Psoriasis.—The usefulness of static electricity in this disease of the skin will depend upon the state of the patient. If he or she is rheumatic or gouty or neurasthenic, or has pains and pruritic symptoms, or presents any lowered condition of general health, the indications for agents which improve the nutrition are about the same as if the psoriasis was absent. It must be applied according to the local and general indications of the individual patient.

Scrofuloderma.—Patients with these lesions are mostly young subjects, flabby of flesh, with pasty or doughy complex-

ions, a marked tendency to chronic catarrhal inflammations of all the mucous membranes, chains of enlarged glands in the neck, and perhaps some old or present bone lesions.

They are often dull and apathetic and certainly stand in need of vigorous static nutritional stimulation. The ulcers may be treated upon ordinary surgical principles. The regulation of the diet and hygiene of the patient and the administration of cod-liver oil, iron, the hypophosphites, or other tonics is the most essential part of the medicinal treatment.

Those who study the nutritional effects of static electricity will desire to add this agent to the above and will feel that full justice is hardly done the patient who is not afforded the benefits of static electricity in addition to cod-liver oil and the hypophosphites.

Dandruff.—Seat the patient upon the static platform and conduct the treatment upon exactly the same lines described for premature loss of hair. The hygiene of the scalp should be of course sensible and simple. The scalp and hair do not need to be washed any oftener than once a week, and those who feel no irritation during longer intervals find once in two or three weeks often enough. Simple tar soap is good. The habits of using ammonia and borax, pomades, hair washes, hair tonics, and of sousing the hair daily are injurious.

For the treatment both of alopecia and of dandruff, general tonic measures, outdoor exercise, and hygiene directed to keeping the patient in the best possible condition so that the nourishment circulating in the blood will reach the extremities, are nearly always indicated even though the patient may think he is perfectly well. The nutritional results sought for are obtained most readily by general and local static electrification.

Varicose Ulcers.—In the treatment of these conditions sedation of pain and other distressing symptoms may be effected by the positive breeze and mild sparks, and local nutrition and circulation may be greatly improved by sparks which may be administered through the dressing. After the ulcer has healed

the tonicity of the vascular walls and muscular tissues may be immensely improved by the tonic action of static sparks, and the recurrence of ulceration in the future may thus be prevented.

Tenderness of the Scalp.—Seat the patient upon the static platform connected with the negative pole. Ground the positive pole of the machine and connect it also with the head breeze electrode arranged about a foot above the vertex. Regulate the current strength according to the comfort of the patient, which will depend upon the thickness of the hair rather than the degree of tenderness.

Continue the application until complete relief is afforded, whether this requires ten or more minutes.

In ordinary cases, and especially when associated with cerebral neurasthenia or temporary congestion of the local circulation, this treatment is speedily curative. It may be repeated as often as the needs of the patient require. Probably no other form of treatment is so satisfactory. To every such case the sedative breeze is a boon.

Chronic Urticaria.—The vast majority of cases of urticaria recover in a few hours or a few days. In chronic cases it is well, says Jackson, to put the patient on a strictly milk diet for a few days and then add other articles with care.

If the gouty or rheumatic diathesis is at the foundation of the trouble it must be combated. If the outbreak shows marked periodicity sulphate of quinine may do good. Salicylate of soda sometimes does good service even when there is no evident rheumatic tendency. In fact, we must endeavor in every way to get our patient into a normal state of health.

The most difficult of cases are those in which a neurosis alone seems to be the cause. Then belladonna, atropine, arsenic, the bromides, antipyrin, phenacetin, galvanism, pilocarpine, wine of antimony, colchicum, and ergot are recommended. In very obstinate cases the patient should be sent away from home and relieved from all business cares.

Amidst the multiplicity of the above recommendations two

facts stand out prominently: one is that the road to recovery is in the direction of improving the general health, and the other is that medical remedies are disappointing. Some local treatment is of great service in allaying the itching but it will not cure the disease.

Both the local and the general treatment of these cases may be successfully carried out by the employment of the most simple ordinary measures supplemented by static electricity, and the patient will neither require to be sent away from home nor resign himself to the unhappy fate of testing in turn a dozen drugs without relief of a permanent and satisfactory quality.

The positive static breeze applied directly upon the skin with the electrode at as a close range as will avoid a spark will prove sedative to the local irritability and stop the itching.

General positive electrification with a tonic breeze to the several nerve centres of the head and spine will do much to aid the endeavor to get the patient into a normal state of health, and in the treatment of neurotic cases, which the dermatologist finds the most difficult, the static machine achieves its happiest results.

It is also worthy of comment that most of the diatheses which may lie at the foundation of the skin lesion are among the diseases efficiently treated by static electricity.

Remarks on the Limitations of Static Actions.—In the examination of writings upon dermatology we find scattered in many places throughout the pages something very like the following: "Arsenic, nerve tonics, and attention to the general health as well as to the hygiene, both of the body and mind, are our most reliable agents."

It is quite evident that whenever cutaneous affections are not self-limited and do not tend to spontaneous recovery, and are either caused by, or aggravate, a state of perverted nutrition, some constitutional measures to restore the normal functions are very important.

To estimate rightly the possibilities of help from static elec-

tricity in these conditions the reader should carefully study the well-known physiological actions of the different forms of administering static currents.

It will be seen that none of the electrolytic action of negative and positive galvanic currents is obtained with static applications. Static electricity does not attack pathological tissues, destroy new growths, remove superfluous hairs, set up an active osmosis, coagulate and dry up the blood supply of a vascular nævus, or soften, liquefy, and absorb an indurated mass or fibroid tumor.

On the contrary, the local action of static electricity is for the most part limited to the relief of symptoms, while its general action is directed to the treatment of the state of the patient. Nevertheless, it possesses exceedingly great value in dermatology, and the more it is employed the more it commands appreciation.

CHAPTER XXX.

CHRONIC OR SUBACUTE INFLAMMATORY CONDITIONS WITHIN THE THORAX.

Effects of static treatment in relieving symptoms and promoting nutrition. Not an expectorant or germicide, but an active nutritional tonic. Methods of treating local and general conditions of patients. Important actions of various applications. A clinical case of phthisis. A clinical case of acute pleurisy and bronchitis. Chronic bronchitis. Chronic tuberculous bronchitis and extreme anæmia. Three clinical cases of chronic bronchitis with histories and results of treatment.

In all the various degrees and stages of bronchial and pulmonary affections one thing is usually certain—the patient is below par and needs reinforcement of tissue resistance.

Relief is also often desired from distressing symptoms which drugs either relieve slowly or palliate only with depressing or injurious effects upon digestion, the heart, or general health. I particularly refer to the common use of opiates in cough mixtures and for the relief of chest pains.

Static electricity will relieve some of these symptoms with a tonic effect upon nutrition. It will relieve the pains, the oppression in breathing, the sense of constriction behind the sternum, the inability to take a deep breath, the general debility, headaches, etc., and do something for the cough.

It will promote sleep, appetite, digestion, and general nutrition. It will exert some beneficial influence upon the catarrhal secretions, but it will not specifically act as an expectorant or destroy the tubercle bacillus.

It will aid appropriate medication in extremely useful ways, and many chronic invalids who are sent to distant climates would save money and thrive better at home with the family physician and the static machine.

Commence the course of tonic static treatment with simple positive electrification for ten or fifteen minutes, after which attend to special symptoms.

Stop the machine and change to negative electrification. If there is headache remove it with the positive head breeze. If there is backache in either the upper or lower spine remove it with a spray, or a spray mingled with mild sparks; or if it happens to be of a very chronic and obstinate character, which is occasionally the case, attack it with counter-irritant and more vigorous methods.

If there is soreness in the muscles of the chest, if the muscles are fatigued by coughing, if there are local pains of any character, if there is a sense of constriction, oppression, and the patient is unable to take a deep breath, have the patient sit erect with chin well up and electrified negatively while a positive spray from the brass point electrode is slowly swept with gentle motion across the whole area of distress.

After it comforts the soreness, have the patient inhale as deeply as possible while a single spark at a time is thrown from the point of the electrode in conjunction with the spray upon the places where pain is felt—upon the sternum and supra-mammary region of each side.

The sense of relief from every symptom afforded within three or five minutes cannot be duplicated by all the other resources of the materia medica. In cases which I have thus treated, the soreness and pain have instantly disappeared, the constriction has vanished, the muscles have been refreshed, and respiration has become full and comfortable.

If the extremities are cold, mild sparks to the cervical and lumbar spine and to the arms, thighs, and soles of feet will warm up the entire circulation.

If the heart action is weak and distressed, the sleep poor, digestion weak, appetite fickle, nerves irritable, and strength at a low ebb, the whole general and local treatment throughout the entire *séance* of about fifteen minutes will be steadily at

work improving the systemic state, increasing muscular strength, lessening the worst symptoms and banishing others totally—in short, accomplishing for the patient at home even in advanced states of the graver lesions and with moderate expense about the best results that could be hoped for by costly travel in search of a curative climate. Potential alternation is a good tonic method also.

If the ailment is an exceedingly minor form of cold in the chest without actually setting up any inflammatory exudation, the soreness and inability to take a deep breath have been removed time and again by the spray and mild spark application at the first visit of the patient to my office, and the relief has been permanent without any other treatment whatever.

If the patient has a history of a former attack of pneumonia, and examination reveals a diminution or total lack of expansion on one side, a very great amount of benefit will be produced, and expansion will be either partly or wholly restored by contracting the muscles with a slowly interrupted Leyden-jar current in exactly the same manner as a faradic current would be applied.

In all the previous applications the patient sits upon the static platform without any exposure of the person, and the treatment is therefore conveniently and quickly applied to all classes of cases.

To attempt to restore activity to the rigid or inert muscles, the clothing must be removed above the waist, and I am in the habit of placing the patient face downward on an operating-chair, with a sponge-covered electrode about the size of the palm of the hand under the solar plexus and connected with the negative pole.

Another ordinary sponge-covered electrode is then moistened, lubricated with soap, and promenaded up and down the spine and over the muscles of the affected side with a very rapidly interrupted high-potential current of just enough strength to produce a decided but comfortable thrill and some muscular

contraction when the electrode passes over motor points. This application increases the blood supply, warms and relaxes the muscles, and prepares them for more active exercise.

Very slow interruptions of about seventy periods per minute are substituted in about five minutes for the previous application, and each set of muscles is subjected to a dozen or more vigorous contractions, after which the back is dried and dusted with toilet powder and the sitting is at an end. This application may be repeated every second day until improvement is fully developed.

Of the action of static electricity in phthisis, Caldwell says:

> I have marked in a number of cases its tonic constitutional effects, and have found it possible to relieve many of the severer symptoms attendant upon advanced cases. The hectic fever, the night sweats, the weak heart action, and the cough will be relieved and the temperature lessened—all tending for the time being to make the sufferer more comfortable, and possibly prolonging life a little.

These are the common observations of experience in the treatment of incurable cases. In earlier stages of the disease it is obvious that the nutritional effects of static electricity are vastly more important than when all hope is passed and nothing can be expected except a little increase of comfort.

For the relief of irritative coughs in these ordinary cases when some simple anti-congestive and sedative action through the larynx will afford relief I sometimes include a few mild sparks to each side of the throat during the treatment, or apply, which is much better, a very rapidly interrupted small Leyden-jar current with a moistened sponge electrode directly upon each side of the larynx, with the dose regulated so as to produce as much tension as will still permit the patient to swallow.

Dr. W. C. Allen reports the following cases:

Phthisis.—Mrs. T——, the mother of three children, became much run down and developed a cough, and an afternoon rise of temperature to 100° F., night sweats, hectic flush in the afternoon, and marked hoarseness and soreness of the

larynx, and was beginning to lose weight; and there were physical signs of consolidation of the apex of the left lung; I gave her positive static insulation, and connected the negative pole with the wooden ball electrode, giving the current over the larynx and chest, both front and back; within three days the fever had stopped and by the end of the first week the night sweats were almost gone; she steadily improved in her general condition, gained in flesh, and the cough gradually diminished, and by the end of three months she was practically well, there being no cough, night sweats, fever, and only a very little of the hoarseness, and there has been no return of the trouble, and her last treatment was given over ten months ago.

Acute Pleurisy and Bronchitis.—Mrs. —— had an acute attack of simple bronchitis complicated with pleurisy at the base of the right side. She was treated as usual, at home and in bed, with medical remedies; but when able to get up she had an intense diffused pain over a large area of the side, a persisting cough, and it was a physical impossibility for her to take a big breath. After some days without change in this condition she came to the author.

She was placed on the static platform and connected with the positive pole; the negative pole was grounded with the brass point electrode. Sweeping the point over the affected region at a distance of about four inches I administered a hot stimulating spray for about three minutes. This disposed of the pain in the side.

The entire spine was then given a couple of moments' spray, and a few dashes of spray and needle sparks were thrown upon the upper chest and on each side of the throat. She stepped from the platform in a perfectly comfortable state, could draw a full breath with normal feeling, and felt greatly refreshed. She had stopped her medical remedies three days before as they "were doing no further good." She took no other medicine afterward. Her nagging cough underwent only a gradual relief and did not entirely disappear for a week, but the other symptoms vanished beneath the negative spray like the mists of morning before the sun, and never came back. She had only the one treatment and has since remained in her usual state of health.

Chronic Bronchitis.—Mrs. ——. This was a uterine case complicated with malaria and chronic bronchitis. I will not detail her history, and will refer here only to the portion of her treatment by static. She was very anæmic, emaciated, had

constant headache, backache, cough, and complained of her feet "swelling at different times." She had become greatly alarmed over the fear that she had consumption, and when first coming to me for treatment was dosing herself with patent medicines for the cure of this disease.

She had a number of reflex symptoms from her uterine condition, but an examination of the chest revealed no evidence of anything but the ordinary form of bronchitis. She received uterine treatment, chiefly by the bipolar method; had a simple prescription for the bronchitis, and between January 22d and March 5th received static administrations three times a week.

Her headaches and backache, reflex symptoms, and distress on breathing were absolutely removed at each sitting, and returned the next day with gradually diminishing severity.

In the course of two weeks she was free from headaches, sleeping much better and steadily improving. At the time of her last visit she was "well enough to get along" from her standpoint, although I should have advised another month of treatment.

In all these cases it is usually possible to do away with the difficulty in breathing and restore the capacity for deep inhalation in a couple of minutes by a process as simple as the turn of a hand. It is preposterous to claim that there is any resource in drug medicine which will produce these nerve and muscle effects which static electricity accomplishes with precision. They may seem "magical" to the patient, but they are nothing more than the ordinary physiological action of an interrupted current of very high potential and small amperage.

No physician who would investigate these actions and witness the effect of a single treatment upon, for instance, a severe case of muscular rheumatism could maintain his attitude of scepticism in regard to static electricity. Physicians who have never witnessed its action can hardly assert that they are competent judges.

In regard to the idea, which is often associated with complete ignorance about electricity, that the forms of applying it are "constantly changing," it might do to ask those who hold this view to point out any difference in either principle or

technique between the administration and effects of a static breeze one hundred years ago and to-day. There is no difference, and the best methods of the present time will apparently continue to be the best methods of the twentieth century.

Chronic Tuberculous Bronchitis and Extreme Anæmia.—Mrs. ——, aged 25, married, has had cough for two years. Chest examined; diagnosis second stage of phthisis. In this case as in others general nutritional applications of positive electrification with a spinal breeze were employed to build up her strength.

A spray with a few mild sparks across the upper region of the chest immediately increased her power of deep respiration and removed the chest pains. She had had only occasional night sweats, and these ceased.

All symptoms except the cough were entirely relieved at each treatment, and returned the next day with lessened severity. This woman was treated two and one-half months, three times a week, with some irregularity. When she got a little better she would dance half the night, or go on a shopping expedition, or do a hard day's work and cool off in a draught. Her relapses kept pace with her imprudences, and while she maintained an improvement in all symptoms but the cough, and had increased in general strength in a very satisfactory manner, she concluded that further treatment was not worth the trouble and expense.

This case is cited to illustrate an every-day experience in practice. Shiftless patients with diseases which are wellnigh incurable begin a short and desultory course of treatment with no better results than they deserve, and forever after say the remedy did them no good. The experience is common to all branches of medical practice.

The following cases are reported by Dr. J. A. S.:

Chronic Bronchitis.—My work with a static machine extends over a period of about twelve months, and the results I have seen from its use have frequently gone beyond my most sanguine expectations. We generally read of its application in such diseases as neuralgias, rheumatics, neurasthenia, insomnia, etc., and I can say in such cases I am rarely disappointed in the

results that I get from its use, and I might say, in a large proportion of the aches and pains that the human flesh is heir to, the results that may be had from the proper use of static electricity are often little less than phenomenal. I firmly believe that its field of application will be greatly broadened as we learn more of its properties and see its effects in pathological conditions. I wish to call attention to a line of work that I have followed for a few months, just passed, in the limited number of cases that I have had, and if they get the same result that I have experienced, I believe they will be more than thankful for having their attention called to the matter. I refer to the use of static electricity in chronic bronchitis, and I do not know how to present this subject any better than to copy from my case book the symptoms, treatment, and result of treatment in some of my cases.

Case I.—Miss G——, aged 36, came to me January 15th, 1896, with the following history: Has had a cough for about five years gradually getting worse, and for the past two years her general health has been failing until at the present time is just able to walk around the room. Never sleeps but a few minutes at a time, and then only in an upright position, on account of great dyspnœa, which is greatly aggravated by exertion of any kind. At the present time coughs on an average thirty to forty times an hour, never goes as long as five minutes at a time without coughing. Expectoration is muco-purulent and very profuse and tenacious; no appetite; bowels constipated; menses regular but a scant flow. A constant irritation in the throat and soreness; voice very husky. A sense of constriction across the chest, and pain and soreness over the lungs, mostly in the back. Has been afflicted with a partial paralysis of the right side for years, which lately has become much worse, but she thinks it is on account of a general weakness. Has had medical treatment from many physicians both at home and from neighboring cities, but has never noticed any marked benefit from any treatment she has ever received but has continued to grow worse all the time. Some of her physicians told her she had bronchitis; others that she had consumption. The last one told her sister that medicine would do her no good and that she had but a short time to live. Examination shows abundant subcrepitant râles over both lungs, no cavities detected nor well-marked dulness, a dropsical condition of the abdomen and legs; she cannot raise the right hand to the head, or raise the right foot as well as the left.

Treatment: Static induced through the upper portion of the

chest, placing the electrodes just below the clavicle on each side near the axilla, passing the current ten minutes to the point of tolerance short of being painful, following with sparks up and down the spine, back, and legs, also over the abdomen, following with the spray over the head twenty minutes. This treatment was continued every other day for four weeks, with a marked improvement of all the symptoms she complained of when the treatment was commenced. In ten days after commencing treatment she expressed herself as feeling better, that she could sleep nearly all night, bowels were regular, and soreness in chest nearly all gone. After four weeks I gave her treatment every third day for about six weeks, when she said she was well, but I gave her an occasional treatment for one month longer.

Patient has not had any treatment for more than six months and says she is perfectly well, has been continually engaged in doing general housework, cooking, etc., for a large family for nearly eight months, and has had no relapse since the improvement commenced, which continued steadily almost from the first, is able to use her right arm and leg as well as she ever did.

Incidentally I wish to remark that I have never used anything in chronic constipation that relieves as quickly and effectively as the sparks over the abdomen. Most of my cases are relieved after three or four treatments, but I generally give about a dozen to clinch the cure and I have never had a patient return and say the cure was not permanent. I presume there are cases it will not cure, but it has never been my lot to have such a one.

Case II.—Mrs. B——, aged 43, July 23d, 1896: Patient has had a cough for fifteen years and came to California six years ago from the East for her health. Twelve years ago had pneumonia and has been in very poor health ever since, getting worse all the time. She has about every four or five weeks what she calls a relapse, when she is confined to her bed for several days and all her symptoms are greatly aggravated. These bad spells are constantly getting worse, has paroxysms of coughing several times a day, generally worse in the morning.

Expectoration is frothy and mixed with muco-purulent sputa; complains much of dyspnœa which is greatly aggravated by any exertions, marked distress in the chest which she describes as a sore pain; appetite poor, very much emaciated, and very weak.

Examination shows subcrepitant râles over all the chest.

Diagnosis: Bronchorrhœa.

Treatment: Same as in Case I. except omitting sparks over the abdomen as bowels were regular. Patient noticed improvement in her condition in a few days after commencing treatment. Is still under treatment and is gradually improving all the time. Has had three relapses since she commenced treatment, but they have been the lightest she has ever had; she was not compelled to go to bed, and recovered from them in a much shorter time than usual. Does her housework and assists in the washing and ironing, something she has not done for more than three years. Appetite is good and digestion fine; she is gaining flesh all the time. Says she is better than she has been for many years.

Case III.—Mrs. O——, aged 29. Patient has been troubled with a cough for six years, which is always worse at night, much soreness in chest and throat. The latter troubles her constantly and she complains more of it than of anything else. Cough keeps her awake the greater portion of the night. Expectorates very freely a muco-purulent sputum, often streaked with blood; appetite very poor and bowels constipated all the time; is not able to do any housework. Also suffers with uterine trouble. Patient was treated by the writer with medicine three years ago and greatly benefited, but now she says she is worse than she was before. Had a sister die from lung trouble, thinks it was consumption.

Treatment same as in Case I.

To-day, three months after commencing treatment, which has been very irregular, as the patient lives about fifteen miles in the country, she says her lung trouble is all right, she rarely ever coughs, and her throat has not troubled her for more than a month, while before commencing treatment it was sore all the time; bowels regular and have been so all the time since commencing treatment. I see by referring to my case book that I have given this patient nine treatments; she is still under treatment for the uterine trouble by the use of the galvanic current, and is steadily improving although very irregular in her attendance. She passed through her last menstrual period without any pain, something she has not done for a long time before.

Case IV. is that of the writer, who has had bronchitis for more than twenty years, and a few treatments given at irregular intervals have dispelled the cough entirely; he feels greatly relieved by not having his sleep disturbed by almost constant coughing. He never found any medication that gave more than

temporary relief. Has not coughed for months until recently, when he had an attack of acute bronchitis which is improving all the time and at present gives but little annoyance.

In conclusion I wish to call the attention of the profession to the relief they can give their patients with pharyngitis, even when complicated with rhinitis, by the use of the static induced current. I have many patients who are troubled with rhinitis complicated with pharyngitis, and I invariably find that a few applications of the static induced, passing the current through the throat from side to side, relieves all those distressing symptoms promptly.

AUTHOR'S NOTES.—While our plans for future writing on static electricity do not permit us to revise every chapter in this book, or to add notes correcting each statement that we would now alter, yet we must speak of the important subject of the chest. On page 344 the original text stated that this current would not act as an "expectorant" in pulmonary cases. Shortly after writing in 1897 we had learned by further experience how to make static electricity perhaps the most decisive "expectorant" at our command.

Moreover, we here testify to the fact unmistakably demonstrated in our long and varied clinical experience, that in static electricity employed by our own skilled methods of technique we have the most decisive remedy against *tuberculosis* that is known to the medical profession. Used with rational management of the case, fortified with every other measure that will do the patient good, re-inforced by the omission of all that will do him harm, static electricity can be made to check early cases with greater certainty and promptness than any other treatment advised, can do fifty per cent better than ordinary treatment with the middle stage, and do more to relieve later suffering and prolong life than all the measures which are now commanding legislative aid and millions of dollars of charity undertakings. Static machines are cheaper and better than the giant enterprises advocated by editors, and agitators of "health boards."

In all stages of the Grip static electricity is our sheet anchor. What we have done with it would seem like extreme exagger-

ation to those who have no experience with large currents and our personal methods of technique. At a future period we hope to put this entire subject into a new book which will deal with it as it deserves. We cannot now alter over this older text.

But here, for the entire series of these selected chapters, let us say that in writing cautiously for beginners we gave directions which are not what we use ourselves for swift and decisive results. No novice can command the confidence of the new patient and work up to a large practice with static electricity if he does not consult the comfort of sensory nerves and the composure of the cerebro-spinal system. But to literally follow our repeated directions for simple insulation without our own active and efficient local methods is a waste of time. The beginner cannot well avoid some of this waste. The expert will not lose a minute.

Throughout the old text we erred upon the side of caution. We now think we were too careful of the patient. Yet many beginners hurt patients far beyond the limit of reason, and to restrict some of the too common abuses we tried to urge the moderate advance from general to local methods. All physicians can speedily apply our principles with discreet selection and omit much of the primitive management that is so wise during the first few months of practice.

In order to assist the author in preparing important statistics regarding the development and present use of static electricity in the United States every physician who sees this chapter is requested to write the author the number of revolving plates in his machine. Also to kindly give the names and addresses of other physicians of his acquaintance who have static machines. This will greatly oblige the author. Simply address him at "New York City." No street address is required.

CHAPTER XXXII.

CHRONIC CACHEXIAS.

Cramps in the legs. Immediate relief given by static sparks. Chronic malarial cachexia. Benefit of positive electrification. Local sparks upon the spleen and liver. Syphilitic cachexia. Static electricity not a specific remedy. Its value as an agent to improve nutrition and relieve symptoms. Malaise. Chronic cachexias in general. The basis of successful treatment. Static electricity similar to a change of climate. Its influence upon negative states of the system. Frequency of treatment. Results of treatment in incurable cases. The treatment of epileptic patients with static electricity. Results of treatment. A clinical case.

Cramps in the Legs.—The static spark affords as certain and permanent relief from this affection as it does from acute myalgia. The relief begins immediately at the first sitting and after a few *séances* generally becomes established. Cramps in the calves occurring in women may depend upon pelvic conditions that require attention before the muscular spasms will be permanently relieved. Galvanic and faradic currents also affect this condition favorably, but the superiority of mild static sparks, which require no removal of clothing, is too obvious to be discussed. Rapidity of action and permanency of effects is also decidedly in favor of static sparks.

Chronic Malarial Cachexia.—In addition to indicated drugs a decided benefit to the patient is produced by static electricity. Positive electrification for fifteen minutes repeated daily or every second day is decidedly helpful in combating the electro-negative cachexia of malaria. Sparks, mingled with a stimulating spray from the brass point electrode, up and down the spine and over the spleen and liver should be applied for about five minutes before the close of the sitting.

Similar treatment is exceedingly effective in hastening the

return of strength after an acute attack of "chills and fever," and when applied at the onset of a chill will abort it; at least this has been the author's experience in a number of cases.

Syphilitic Cachexia.—Static electricity does not treat syphilis or any specific poison. Inasmuch, however, as the later stages of this disease are sometimes complicated by conditions and symptomatic derangements which call for local relief or constitutional measures of a tonic character, it is well to remember that in the Holtz machine we possess an efficient means of giving symptomatic relief and nutritional aid to the patient even though a cure of the syphilis itself depends on other remedies. Electricity will act harmoniously with these remedies and add considerably to the patient's satisfaction.

I have rarely seen—never to my present recollection—a weak, cachectic, anæmic man, suffering from head, joint, or muscle pains, nervous or circulatory disturbances, or any of the functional miseries that sprung out of Pandora's box, refuse to receive the usual benefit from static electrification because he once had syphilis. I have seen a persistent headache in a well-nourished and powerful man which was not at first suspected to be syphilitic, but which incapacitated the man from work, remain relieved for twenty-four hours after the application of each static head breeze repeated three times a week.

When any pain is promptly relieved but promptly recurs again in this manner during static treatment, it is diagnostic of some cause not previously suspected but which is not amenable to the action of the current. A closer examination of the patient should therefore always be made to discover and remove the underlying cause. In this case the patient finally admitted what he had at first denied, and upon taking a mercurial, or rather mixed treatment for a week, and omitting the static application, his headache remained as bad as ever. He accordingly returned again for the static application which he had found to afford him such welcome though temporary relief,

and this time there was a rapid improvement of his general condition and the headache soon ceased to give further trouble.

While it may be assumed that in any chronic disease upon which medication exercises a slow and gradual influence the patient will receive in time the full measure of relief from symptomatic manifestations, yet there is something eminently satisfactory to the patients in accelerating these benefits and in providing them with an immediate sense of well-being, renewed energy, muscular strength, and relief from disturbing symptoms. If the faculties are thick and dull they are wonderfully cleared and refreshed by the positive breeze on the spine and head.

Malaise.—When the condition of malaise, languor, and inability to exert the faculties in any desired work is due to temporary functional derangement, it is removable in a few moments' time more certainly and permanently by static electricity than by any other medical means. Even if quinine, or an unloading of the portal circulation, or any other procedure is also required for lasting effects in malaise of a more deep-seated character, the static application will give immense immediate relief.

Seat the patient upon the platform connected with the positive pole and ground the negative pole. Between the metal tray and the patient's feet insert the usual mat of protecting material, and administer about ten minutes of potential alternation.

The restorative effect of this method will be enhanced by a mild application of positive sparks to the general surface of the body before closing the sitting, in cases who will receive sparks agreeably.

Chronic Cachexias in General.—In these depraved states of whatever sort—whether malarial, pulmonary, specific, or any other condition susceptible of relief from harassing symptoms, and temporary if not permanent constitutional improvement,

the general and local methods of static applications are of practical value.

The basis of treatment will be general positive electrification for fifteen minutes if no local application is required in the individual case.

Other measures such as the spinal or head breeze, sparks to the spine, abdomen, liver, spleen, extremities, or special nerve trunks, should be engrafted upon the simple tonic electrification, either for the relief of local symptoms, or in almost every case for their additional effects upon nutritional activity.

Both medical and hygienic resources need all the aid they can get in the treatment of these chronic and often incurable conditions. Static electricity is the most practical and useful auxiliary remedy that I know of, and can do more to promote comfort, and re-establish as near a state of health as is possible, than many things commonly recommended. The patient is very much more certain to be benefited by three months of treatment with the static machine than by three months of travel and change of climate.

Frequency of treatment should be regulated by the effects upon the individual patient. Daily *séances* are advisable until benefit from a single treatment is fully maintained for more than twenty-four hours. Applications may then be made every second day, and finally the patient may return for treatment only when the need of it is felt.

Those who have learned not to expect to cure all the chronic ills that flesh is heir to, but are thankful to be possessed of a means which will help them improve the condition of patients who are likely never again to enjoy sound health, will obtain the greatest possible aid from a skilfully handled static machine.

Before undertaking these cases the physician should ground himself in the study of the physiology of static currents and the operation of the apparatus.

The Treatment of Epileptic Patients with Static Electricity.—In so far as the individual is in poor general health

with depraved nutrition, aggravated perhaps by the depressing effects of drugs, benefit may be reasonably expected from static administrations. The seizures may also be reduced in frequency. In cases associated with pelvic derangements, the gynecological applications of galvanic and faradic electricity will also do much to improve the condition.

Of the actual cure of epilepsy, however, I have nothing to say. In young subjects, whose attacks are recent and apparently due to some exciting cause which static electricity will ameliorate, the prognosis would be better.

One thing is certain, and that is the general toning-up of the whole nervous system which will take place during a course of static treatment. This is well worth securing in almost every case which has long been subjected to the influence of bromides.

Two years ago I attended a patient about fifty-one years of age, whose epilepsy had been "traced to the ovaries" by one of the most distinguished gynecologists of this generation. During the pioneer days of laparotomy he had removed this lady's ovaries without any subsequent effect upon the epilepsy. When she died suddenly with fatty infiltration of the heart, the autopsy which I attended disclosed the fibrous bands of a localized old inflammation of the dura, and the epileptic seizures were attributed by the pathologist to the irritation at this point.

This case shows how uncertain the removal of ovaries, the application of electricity, medical or other remedies, may be in the treatment of epileptic patients.

It may be said of static electricity in its relation to epilepsy that quite a number of physicians have had different experiences with it, and that in cases which have the least amount of structural change as a cause the prognosis is most favorable; and in all cases the general health of the patient will be benefited if this is below par. Each case, however, must be considered by itself and the patient should be treated without any promise whatever.

Dr. F. A. Kraft, Milwaukee, Wis., reports the following case:

Epilepsy.—Mrs. L. M——, a lady, 32 years of age, presenting a severe case of epilepsy, which was the result of fright dating back about four years.

The lady was in perfect health previous to her first attack. The epileptic fits were of great severity and occurred on an average of twice in three weeks. Her appetite was very poor; the bowels did not move unless a cathartic was taken. The patient looked like a shadow, and her family despaired of her life.

I recommended static electric treatments and began to give the same, one every day for thirty days, prescribing additionally compound syrup of phosphate. On the seventeenth day from beginning of the treatment she had a slight attack of an epileptic fit, lasting only a few minutes. Her appetite improved, she gained nine pounds during the first month, her appearance has changed for the better, and constant improvements are recorded. After the thirtieth static application I lessened the treatments to one every other day, and gave her twenty more.

The results were incomparable to any case of this kind I ever had to treat. The 3d of September, 1896, the lady looked like the healthiest person that ever lived, had gained two and one-half pounds during the time of her taking treatment, which after the fiftieth call I diminished to two treatments a week, and although I cannot pronounce her case a complete cure, it has plainly shown what results are obtainable from proper systematic treatment with static electricity.

P.S. November 30th, 1896: the lady, Mrs. L. M——, had to this day not a single attack of epileptic fits, feels well, and I think the case will result in a complete cure.

CHAPTER XXXIII.

TONIC EFFECTS IN VARIOUS CONDITIONS.

Convalescence from acute exhausting diseases or any low state of health. Method of employing static electricity. Its importance as a remedial agent. Nutritional remedies always indicated in these cases. Clinical observations of the effects of static electricity upon nutrition and increase of body weight. Selection of methods. The oscillating static current. Therapeutic actions. Benefits to patients treated by static electricity. Chronic effects of shock. Methods of treating patients. Chronic effects of heat prostration. Value of static electricity in restoring nerve tone. Methods of treatment. Nervous chill. Other forms of chills aborted by static sparks. Static electricity as a regulator of the temperature and circulation. "Half-frozen" patients quickly warmed during treatment upon the static platform. Curative results. Enuresis relieved by sparks to the perineum. The value of tonic general electrification in chronic interstitial nephritis and chronic catarrhal cystitis. An illustrative case.

Convalescence from Acute Exhausting Diseases or any Low State of Health.—Insulate the patient upon the static platform with direct metallic connection to the positive pole of the Holtz machine. Ground the negative pole. If the patient is still in a very feeble state, give only simple positive electrification for ten or fifteen minutes daily for the first few *séances*.

As soon as discretion permits, add three minutes' breeze to the head and the same to the spine at each sitting, with the brass point electrode in gentle waving motion, and at a distance to make the application most agreeable. Use only a mild non-irritating breeze; and if the clothing of the patient is such as to make the negative breeze unpleasant, stop the machine and change the platform rod to the negative pole and administer the positive breeze of less potential.

Repeat daily until improvement is so far advanced that three

times a week will be sufficient to continue until strength is fully established.

When the early improvement has progressed to the point of willingness on the part of the patient to receive other applications, a few mild sparks at each sitting should be applied to the spine and to the muscles of the limbs. The exercise thus given to the muscles rapidly imparts tonicity and strength. Usual restorative remedies may be given at the same time, and no means neglected to hasten recovery, for electricity never interferes with the action of medication. Among various means at the physician's command to shorten the tedium of a slow convalescence probably no other agent exceeds electricity in value.

In these cases also the author's method of potential alternation, vibratory massage is one of the most effective tonic administrations. It is advisable to wait a few days before employing it so that the patient may become thoroughly accustomed to the static machine and recognize its benefits.

As long ago as 1777 we find Cavallo recording the belief that "electricity assists the innate endeavor of nature to restore the sound state." To this useful function I shall now devote a few moments' consideration.

If it is the first consideration of therapeutics to prevent disease, it is certainly of almost equal importance to repair its ravages.

It seems to the writer that on too many occasions we are content with relieving pain, reducing temperature, carrying our patients through acute crises, operating brilliantly, or employing chiefly those palliative measures to which the limitations of our science unfortunately often restrict us. The rest we are prone to leave to nature. Indeed it has been well said that the "triumphs of medicine thus far have been in alleviating pain and in the prevention of disease, rather than in the cure of actual and active morbid processes."

But to all classes of cases—the child delayed in resuming its mental and physical training for future work, the son or

daughter about to enter business or society, the business man in enforced detention from his active interests, the workman losing his needed wages, the wife or mother on whom the home depends—to all these alike the period of convalescence, of reconstruction, possesses an enormous material importance.

The sequelæ of **acute and short-lived diseases** often prove more tedious and disastrous to the patient than the initial invasion. States of anæmia, of deficient innervation, of organic and functional debility, of lessened tissue resistance, are created which unfit the individual for the duties of life, or render undue exertion dangerous, and out of which the slow processes of imperfectly aided nutrition conduct him with faltering and leaden step. Relapses occur which renew and prolong anxiety, and when recovery is complete (?) there may or may not be the fullest possible restoration of anatomical integrity and the processes that maintain sound health.

I need mention no more than the frequently protracted convalescence from typhoid states, from influenza, from pneumonia, from scarlet fever, diphtheria, or dysentery to call to the mind of the observant practitioner an endless procession of illustrative cases.

So, too, in many chronic cachexias, whether the cause is removed or not, "vitalization of tissue is what these patients need." They need fortifying against toxic attack. For obvious reasons the specialist, surgeon and consultant, does not usually concern himself with hygienic and general measures directed to the ultimate removal of the effects of the disease which no longer exists, or of any cause which he has employed his special skill to eliminate. This is the province of the physician, and in a great measure his success in practice will be proportioned to the care with which he finishes up the tonic treatment of his cases.

It is now my intention to pass over the familiar tonic agents, because we all know them, and to speak of one of great value, but as yet too vaguely appreciated in general practice.

It is one of the curious phases of medicine to-day that it often reserves the aid of electricity till all else has failed, till organic lesions have obliterated nerve cells and nerve fibres, both functionally and structurally, and then demands that electricity, to prove its power, shall, in effect, "reconstruct an organized animal tissue from its ashes." I shall not debate the question of whether this medicinal agent can create something out of nothing, life out of local death, for only its opponents seem to expect that; but it is my purpose to refer in brief to one of its humbler yet still valuable properties.

Says a prominent teacher of therapeutics: "One characteristic and almost invariable effect, due to electric stimulation of the peripheral nerves and their end organs, is the improved nutrition of the patient. It is a matter of common observation in a clinic, where the poor are treated by electricity alone, and in a great variety of methods, local and general, that they make a rapid increase in weight and general health, irrespective of the progress which may ensue in the disease for which they are under treatment."

Indeed the latter may be an incurable one, but we can often treat the patient when we cannot successfully treat the disease, and even in such cases the results may be exceedingly gratifying. Phthisis, in its first and second stages, is a case in point.

In a paper read before the Neurological Section of the American Medical Association, another authority states: "It has always seemed to me that the most important thing in the use of electricity in medicine, the fundamental idea upon which all its therapeutics is based, is its nutritional power."

My own experience for several years devoted especially to the uses of medical electricity has afforded me ample proof of the correctness of the above views; and I may say in passing that I value the services of this agent far more for its utility in a thousand practical every-day cases than for its power to partially benefit an advanced stage of some rare or incurable lesion of the central nervous system.

In the widening range of currents now offered to the expert in electro-therapeutics there is an opportunity to select our methods according to our case.

Local applications for specific local purposes are not here referred to by the author, although certain local methods extend their influence into the general nutrition; but of the effects of what is known as general electrification, whether by galvanic, static, sinusoidal, or faradic coil currents, I propose to speak particularly.

They are all valuable tonics. In convalescence they may be considered alterative, tonic, and restorative, capable of doing excellent service unaided by drugs, and more directly in the line of hygienic and climatic influences. If bodies in low states of health are found to be negatively charged, then the positive charge (which is the rule in health) derived from the static machine is in the nature of a change of climate, and in fact is quite often as beneficial.

The pre-eminent place in nutritional effects may be allowed to the constant galvanic current when the "central nervous system" is principally at fault and degenerations have occurred; but when the debility is rather muscular, circulatory, or functional, then my preference is for an interrupted current capable of producing a powerful impression on the peripheral nerve filaments and stirring to their depths the trophic centres.

In September, 1893, I described a new method of administering an interrupted (oscillating) static current, and it is this method, originated by me, which I employ in the large class of cases requiring an energetic re-invigoration of vitality.

Administered without the removal of any of the patient's clothing and involving no tedious technique, I nevertheless regard it as an efficient substitute for the D'Arsonval "high-frequency bath," and for most other forms of general electrification.

If direct muscle massage is indicated the static spark is demonstrably one of the most effective methods of producing

it, and we have but to add its local influence to my general administrations to secure results of a pronounced character. Regarding the muscular contractions produced by the local spark as a gross massage of the tissues, it is considered that in the general vibratory administration of a rapidly alternated potential we subject the constituent particles of the tissues to an insensible molecular massage, the benefits of which are apparent in the vasomotor system, in better circulation, in increased excretion, in better oxidation, better sleep, more cheerfulness, more vital energy—in short, in an increased functional stimulation and in general progressive improvement.

This is just what we want in convalescence from acute prostrating diseases; just what we want also in every case of lessened tissue resistance when restorative measures are indicated and are practicable, even in diseases like diabetes, Bright's, and phthisis.

In chlorotic conditions, amenorrhœa, and derangements of schoolgirls, especially if a legacy from earlier illness which is not outgrown, the nutritional value of electricity is of very great importance.

It is vastly more useful, I repeat, when freely employed, as it should be in these cases, than when reserved for advanced stages of lateral sclerosis and spastic paraplegia.

It is a sovereign tonic in the debility of old age and in the vast range of so-called "female weaknesses" for the same reason that it serves us in convalescence. If individuals in general, of any age, were "finished up" through complete convalescence to the fullest possible restoration of strength by those whose skill was not found wanting in the acuter stages of disease, there would be less prevailing anæmia, less neuralgia, less "nervous prostration," less dysmenorrhœa, less headache, and less poor eyesight in men and women; less hysterics, less dyspepsia, less disappointment in life, less surrender to the invasion of microbes, less catarrh, less phthisis, less insanity, less crime, less suicide.

I am accordingly an earnest advocate of nutritional remedies during convalescence and in every depressed state in which they are admissible. Not second in value to cod-liver oil, the hypophosphites, phosphorus, iron, or arsenic, but a useful adjunct to them all, will be found the administration of some form of medical electricity.

The profound restfulness and comfort produced by vibratory potential alternation elicits many expressions of satisfaction from patients. Employed conjointly with other indicated therapeutic and hygienic measures in debilitated states, I know of no method of electrical treatment preferable to it in many cases. In either acute exhaustion, fatigue from worry and work, brain and eye fag, or more chronic conditions of debility, neurasthenia and anæmia, it is extremely useful.

Chronic Effects of Shock.—Sudden fright, narrow escape from fatal injury, business calamity, and other causes not infrequently produce a condition of shock which long leaves the nervous system unstrung and in a state of asthenia.

In these cases the sedative-tonic and restorative influence of static electricity does for the patient what no other agent known to the author can so well effect. It is the remedy *par excellence* for morbid fears, debility of the sympathetics, hypochondriacal, melancholic, brooding and deranged states, from above causes.

If anæmia, constipation, and indigestion coexist prescribe the remedies indicated, but the outdoor diversions which would benefit these patients are often reluctantly regarded and the tendency is to neglect them. The chief coercion upon the shattered nervous system must be exercised by some means independent of the person's will.

One of the best agents for this purpose is static electricity. It seizes hold upon the nervous forces, occupies them, diverts them, engages their whole attention, and by mild and gentle compulsion directs them into natural channels of action and restores their natural strength.

Seat the patient comfortably on the static platform connected with the positive pole. Ground the negative pole and administer simple positive electrification for fifteen minutes at the first sitting. After a few treatments in every case, and at the very beginning with others who feel no undue timidity, a positive head and spinal breeze may be added to the simple electrification.

When improvement has well advanced so that the nervous startings have been outgrown and composure and endurance have somewhat returned, the principal muscles of the body may be exercised by mild sparks.

As soon as these can be given with agreeable toleration by the patient the improvement is more rapid, and general nutritional and restorative processes soon terminate the need for further treatment.

The headaches and insomnia which trouble most of these cases are among the first symptoms of the condition to disappear. The treatment should be repeated daily at first and follow the usual rule as benefit progresses.

These unfortunates, whether men or women, are frequently left to time to outgrow their infirmity, and it takes a long time to do it. They are not considered invalids and they encourage themselves in the belief that they do not need any medicine, but they are more or less unfitted for their regular duties, and their enjoyment of life is considerably diminished.

With a knowledge of the good effects of static electrification no physician is justified in neglecting to give any case of this kind the benefit of so valuable a therapeutic measure.

Chronic Effects of Heat Prostration.—As the victims of sunstroke or heat prostration survive with morbid susceptibility to future heat exposure, and are often for many years afflicted with neuroses traceable to this cause, it is gratifying to know that the electro-therapeutist can do much to palliate or even remove the condition.

Positive static electrification for fifteen minutes about four

times a week for a period of two or three months will do much to restore the system to endure the heat of the following summer.

Supplementary methods for sedative-tonic effects should be selected and applied, according to the judgment of the physician, in the management of the particular case. The head and spinal breeze and mild spark will be useful in many cases, but no routine method can be pursued.

Personal experience illustrates the value of static electricity as a restorative after the acute stage. One patient of mine who could not venture into her own kitchen four years after her attack without suffering, made good improvement under positive electrification supplemented by the spinal breeze.

For the headache which is usually a feature of these cases, and also for the mental asthenia, administer a positive head breeze, regulated in strength to comfortable tolerance, for several minutes at the close of each *séance*. When applied by means of the stationary electrode request the patient to gently move the head from side to side and rotate it slowly so as to direct the breeze upon every portion of the cranium.

Nervous Chill.—Chills from exposure to cold and even the chill of ague have all been aborted or speedily ended by me by the application of static sparks.

The regulating tendency of static electricity upon the circulation and temperature of the body is very marked, and is always one of the first things that attracts the attention of patients coming to the office in cold winter weather and in a state which they declare to be "half-frozen."

It accomplishes the warming process in a manner which seems peculiarly to gratify these patients, and which differs very much from the effects of a stove, hot-water bag, a hot drink, or a stimulant. It in fact does not act as a stimulant or as external heat but as a regulator of the internal functions to normal.

Ground the negative pole and the brass point electrode to the

gas fixture. Connect the patient with the positive pole of the Holtz machine. Start the plates into medium action, which, if the power is an electric motor, will soon increase in speed as the resistance of the circuit diminishes. Commencing at the spine, apply a strong, warming rubefacient spray up and down the back, across the abdomen, and over the lower extremities until the body is in an agreeable glow. Discharge occasional sparks from the electrode by sweeping it nearer the person.

If the patient is accustomed to the treatment and not afraid of sparks exchange the point for the brass ball electrode, reverse the polarity of the platform, and apply a few single thick and long sparks to the soles of the feet through the shoes, to the muscles of the legs, and to the spine.

The warmth that follows this vigorous application is curative of the chill, unless the cause is the invasion of an inflammatory disease, in which case, of course, the failure of the current to produce any but temporary effects is at once diagnostic and medical measures are indicated. There is no reaction, however, in the class of cases to which static electricity gives practical curative relief and the method is remarkably satisfactory.

Enuresis. —When this yields to ordinary remedies it is useless to consider electricity in its treatment; but as at times all medication seems to fail, one of the simplest and best alternative methods, requiring no exposure of the person, is the application of mild static sparks to the spine and perineum. Good results have been recorded after a few treatments in some very intractable cases.

The Value of Tonic General Electrification in Chronic Interstitial Nephritis and Chronic Catarrhal Cystitis.—A case of this kind among others in my recent experience was as follows:

Mrs. ——, aged 48, neurasthenic, anæmic, and hyperexcitable, consulted the author for relief from intercostal neuralgia supposed to result from an injury two years previous.

Treatment: Positive electrode, 2x2, over pain anteriorly,

negative *ditto* to back of neck. Constant galvanic current, ten milliamperes for ten minutes, raised for two minutes during each *séance* to fifteen and twenty milliamperes, maximum, as tolerance increased.

Also simple positive electrification on static platform for ten to fifteen minutes. Sittings three times a week.

Relief to all symptoms began with the first application; returns of pain became lessened in both frequency and severity. Iron was prescribed for the extreme anæmia at the end of the first week.

The improvement in her nervous condition, sleep, energy, and composure was so rapid that in one month she felt better than in five years before and her friends all remarked how well she looked.

Up to this date nothing directed attention to special organs. She next called with report of foolish exposure to cold and wet in investigating the effects of a furious winter storm the day before. She complained of severe pains in the lumbar region and the situation of the kidneys. This was completely removed by an application of a high-tension rapidly interrupted induction-coil current and a specimen of urine was procured.

The pathologist's report of the examination stated the diagnosis of "chronic interstitial nephritis and chronic catarrhal cystitis."

As these conditions were not previously known, the case illustrates the beneficent nutritional effects of static electricity in the treatment of patients, even when it is not assumed that it treats some special disease which the patient may have.

This lady continues to feel better and I believe that in many cases of Bright's disease, diabetes, and chronic inflammations of the bladder, the action of other remedies would be most efficiently aided by the auxiliary tonic action of static electricity.

CHAPTER XXXIV.

IMPAIRED VOICE OF SINGERS—DEBILITIES OF THE AGED.

Pharyngitis, laryngitis, voice fatigue, or hoarseness of singers and speakers. Rapid relief afforded by high-tension currents. Method of treatment. Results of treatment. Clinical cases. Results in a chronic and incurable case treated with static electricity. The debility of old age and chronic invalidism. Immense value of static electricity to these patients. Methods of employing its usefulness. Its benefits long-lasting.

Pharyngitis, Laryngitis, Voice Fatigue, or Hoarseness of Singers and Speakers.—In these cases, where the trouble is chiefly congestion or fatigue of the vocal apparatus and the voice becomes thickened and husky or loses in any respect its tone or controllability, both the high-tension induction coil and the static machine afford excellent methods of treatment.

If the static machine is used I insulate the patient negatively and send a few sharp, thick positive sparks to each side of the larynx, with the patient's chin well up and turned to the opposite side. Use care to avoid sparking the chin or the sensitive regions of the upper part of the chest. Next apply a few similar sparks to the cervical spine. An alternative method employs Leyden jars.

Place the small Leyden jars in circuit and press an ordinary hand, sponge-covered electrode moistened with hot water to each side of the larynx externally. Place the sliding poles of the static machine in close contact. Start the plates into rapid action and draw the poles gradually apart until the muscular effect is as strong as possible without producing discomfort or preventing the patient from swallowing and breathing.

During the passage of the current put the vocal cords into

action by requesting the patient to practise deglutition, inaudible sounds, or even the vocal scale aloud.

After from three to five minutes of this continuous application of an anti-congestive, sedative-tonic current through the vocal apparatus reduce the dosage about twenty per cent and then institute a series of rising current waves, by suddenly increasing the spark gap to the utmost limit of tolerance and instantly decreasing it again.

Twenty or thirty such rhythmical impulses may be sent through the tissues in two or three minutes. Then let the machine come to a gradual stop, and while the spark stream loses its high frequency there will be a gentle exercise of the throat muscles as the interruptions of the current become slower and slower till they finally cease.

Repeat as needed in acute cases, relief being very speedy. In chronic cases the first sittings should be daily, with later repetitions regulated by the circumstances of the case.

The Leyden-jar method is a favorite with the author and achieves such gratifying results that patients as a rule are delighted. As a means also of preserving a failing voice which is still the owner's dependence for support, this tonic application repeated for a few times as often as the need arises would put off the evil day for a long time. From operatic stars to choir singers, and from dramatic and political to pulpit orators, there are many who would rejoice to know of so valuable and swift a remedy for any temporary strain upon the voice. If the throat specialist has anything to offer in similar cases that can compare with the efficacy of this method I am not aware of it.

To the worried and alarmed singer, fearful of pecuniary loss and unable by desperate efforts to command the vocal cords, the static electrodes appear to be the wonder-wands of magic. The current, however, simply relieves congestion, restores tonicity to the muscular fibres, and the voice revives again. In such cases also, whenever the general health and especially

the nervous system is below par, the *prima donna* or the humble but necessary singer in the chorus or choir, may easily receive the usual benefits which positive static electrification bestows upon all who require its tonic action.

Chronic Voice Fatigue.—Mr. D——, aged 50, sings in a choir regularly. Has done so since boyhood. During the past year or two has noticed that his voice has begun to show wear. He was treated with the Leyden-jar method, which I generally employ instead of the sparks. The immediate improvement in his voice was noticed by his choir leader the next day. He was treated a few times with increasing improvement and when his voice fails again he will return.

He was not only delighted but surprised at the remarkable benefit which his voice obtained so rapidly and so easily, and he remarked, as others always do, that if persons who use their voice as a means of support were aware of the existence of such a practical remedy for functional derangements they would all be glad to utilize it.

Mr. S——. Acute laryngitis of mild form with partial aphonia. Could hardly talk above a whisper and voice was so husky that he said he thought he had "caught cold." He was treated for five minutes in the usual manner, with the rapidly interrupted high-tension current and as he then appeared able to talk with very nearly a natural voice no other treatment was given. Two weeks later he returned with a recurrence of the same cold from exposure to wet weather and the same treatment acted as before.

The following relates my experience with a chronic and probably incurable case.

Miss ——, aged 20, anæmic, had adenoids removed two years ago. Has a chronic catarrhal pharyngitis, has been hoarse since she was about three years of age. Has no special symptomatic derangement. Has been taking vocal exercises from a celebrated music teacher, who assured her that he could cure her voice, but the strain makes it worse.

She has been treated locally and generally in a number of different ways by different physicians, but her voice, at the

time of her coming to me, was extremely husky and possessed very little power. It was a source of mortification to her, and treatment was begun with general static electrification and continued with alternations of both the spark and Ledyen-jar current to the larynx.

After the earliest application she felt a choking sensation, which presently passed off, but benefit did not begin to appear until the fifth treatment. At the tenth treatment the voice was much less guttural. On the sixteenth visit she appeared as hoarse as ever and had myalgia of the right shoulder, the effects evidently of a sleigh-riding party which she had participated in two days before. The static application removed both the myalgia and the extra hoarseness.

At the eighteenth visit she appeared to have gained considerably, her voice was much clearer and she was pleased and hopeful. At the twenty-second visit my entry reads: "Voice improves steadily, cannot do scales without the current as it chokes her, but with the electrodes applied and the current passing she can practise scales loud and clear; is very much better."

At the twenty-ninth treatment her voice was quite smooth and clear, she could take high notes with the aid of the current very well, and she concluded that her total improvement was equal to about sixty per cent.

Between the 19th of January and the 6th of April, 1894, she received thirty-eight applications, during which time she sometimes improved and sometimes relapsed. She then went abroad for a year and on returning I learned that the improvement had remained about the same. During the middle portion of her treatment a few intercurrent applications of a mild galvanic current were administered to relieve the monotony of action upon the tissues.

The following case reported by Dr. Caldwell expresses in a few brief words the ordinary experience of physicians who possess static machines:

About two years ago a prominent baritone singer was sent to me for electrical treatment, suffering from paralysis of the right vocal cord. My treatment consisted of negative sparks on the cervical region for five minutes and on the larynx for four minutes. A few such applications restored the vocal cord and his voice to their normal condition.

The Debility of Old Age and Chronic Invalidism.—Cases

occur in the experience of every physician in which some restorative influence is needed beyond the resources of drugs, food, and rest, to fit the patient who is stricken with disease in advancing years to escape from house confinement, get out of doors, and once more resume the ordinary habits of comfortable if not entirely vigorous old age.

Some of the most estimable men and women in both public and private life cease their activities before their time because of imperfect convalescence from sudden and brief illness. In many cases there is no lack of means or desire to procure every aid within the resources of medicine, and I therefore suggest one measure, rarely utilized as it might well be, but not surpassed in its comfort-giving and strengthening properties by any of the tonics of pharmaceutical art. It is within practical reach of many families who would gladly avail themselves of so simple and effective a means of benefiting the objects of their solicitous affection, if their physicians but brought it to their notice.

I would recommend in all such cases the employment of static electricity as a general nutritional agent—mild and agreeable in its action. At but a moderate cost the family can purchase a six-plate twenty-six-inch Holtz machine and have it set up in the apartment of the invalid, who can then daily enjoy its subtle and far-reaching benefits under the direction of the medical adviser.

Even when the patient is too feeble to rise from bed the couch can be insulated on glass supports, a chain from the prime conductor can be passed under the covers to the patient's hands, and positive electrification administered for fifteen minutes, twice a day.

Long before the feeble invalid would be recuperating under ordinary treatment sufficiently to endure a much-needed drive in the sunshine and bracing air, the static machine in his own room could be strengthening muscles without taxing the weak heart, revitalizing the nervous system, and serving as a most

admirable substitute for the exercise that cannot yet be taken.

If sleep is deranged the sedative influence of the soothing head breeze or an application to the cervical spine can be invoked at bedtime. If rheumatic, muscular, or other pains, and symptomatic disturbances occur during convalescence the skilful application of some form of static current will nearly always give general relief.

Whatever building up of the tissues can be done by usual remedies may go on hand-in-hand with the daily use of static electricity and will be promoted by it. The remarkable facility with which this high-potential therapeutic resource may be employed in sustaining and restoring the feeble powers of the aged of either sex is a strange *terra incognita* to the vast majority of physicians. The medical mind, familiar only with minor faradic therapeutics, or perhaps acquainted in general with the limitations of both faradic and galvanic methods of technique, may well be surprised at the radically different capabilities of the modern Holtz machine.

No case of the kind here considered can be regarded as receiving the fullest benefits of scientific medicine until properly directed static electricity is added to the extra-drug therapeutics of the attending physician.

Nor will the usefulness of this tonic agent end when the patient is again able to take part in the affairs of life, but daily throughout the remaining years vouchsafed in this world it may be employed with continuous satisfaction and benefit. Speaking from personal observation of the good effects of proper methods of static electrification in the infirmities of the aged I cannot too strongly advise the use of so helpful a remedy in assisting to smooth the pathway, and comfort and sustain in mind and body the closing scenes of those veteran pilgrims whose stay on earth exceeds the psalmist's limit, often by many years.

CHAPTER XXXV.

THE CONTRA-INDICATIONS OF STATIC ELECTRICITY.

Aggravations by static electricity. Aggravations shown to be unnecessary with careful regard to proper indications.

THE thoughtful consideration of every physician is invited to this phase of the subject of medical electricity.

When the indications for selected methods of electrical treatment are properly understood, and an intelligent idea of contra-indications is obtained, a great step is taken toward rational therapeutics.

It is one of the misfortunes attending the lack of undergraduate instruction in electro-physiology that many patients to whom the resources of medical electricity would be an inestimable boon are deprived of its beneficent action through erroneous medical advice. There is certainly no other branch of therapeutics which suffers so much injustice through lack of information concerning its actual merits. The utmost conservatism has guided the author in his statements in this book covering the therapeutic action of static electricity. Extreme care has been taken to eliminate every word of extravagance, and probably twenty-five per cent could be added to the majority of the author's remarks in behalf of this valuable agent without exceeding the limits of absolute adherence to fact.

This being the case, it is a matter of great regret that the entire medical profession is not so well informed upon the physiological action of all electric currents as upon the actions of leading drugs.

While the indications for different forms of static electricity

cover the general range of usefulness set forth in the chapter on physiology, yet the contra-indications are seldom concisely stated. They are as follows:

General Electrification.—A careful study of the action of general electrification upon the pulse, temperature, respiration, and secretions demonstrates that there is no state of the tissues in which it would be essentially injurious—there being no state of disease in which a regulation of the functions to normal is contra-indicated.

Clinical experience demonstrates that general electrification acts without harm, and with benefit, in all diseased conditions amenable to curative treatment, whether they are acute or chronic, febrile or the reverse.

General electrification will not benefit perceptibly a person who is already in sound health, and patients who exhibit any of the conditions which prevent office visits do not present themselves for static treatment; hence these are *negative contra-indications.*

Positive contra-indications to general static electrification can hardly be said to exist, for it produces no injurious effects upon the human system. It is as harmless in acute inflammations as in chronic diseases, although medication supersedes it for various reasons.

The Static Breeze.—Contra-indications can hardly be said to exist for purely sedative forms of the static breeze. These can have no possible injurious effects, and the only contra-indications can refer to the fact that when other measures are needed it would be a waste of time to employ an application which was not the most effective that could be used.

Passing from the sedative to stimulating, rubefacient, and counter-irritant forms of the breeze, it suffices to say that both indications and contra-indications conform to the general principles of medicine, and do not differ because the agent which produces these effects is an electric current instead of a drug formula.

The Static Spark.—The great contra-indication for powerful static sparks is the same which forbids mechanical violence of any other kind. There are, however, modifications of the static spark, so that contra-indications undergo equal modification; and in many cases of disease, when the pressure of the hand cannot be borne without pain, a mild static spark will allay the pain, restore local nutrition, and bring about symptomatic relief in many cases, and an entire cure in some cases. This is common clinical experience.

Leyden-Jar Currents.—If it be granted that the operator conforms the application and dosage to the therapeutic requirements of the case it can almost be said that positive contra-indications do not exist. A strong current is of course contra-indicated when a weak one is required, a slowly interrupted current is contra-indicated when the physiological effects of a rapidly interrupted current are sought, an application with labile electrodes may serve in one case while another case would require that the electrodes were stationary—and so on through all the gradations of electro-therapeutic administrations, we may balance one method against another, and finally find that there is scarcely a patient who could not be treated in some way by some form of static electricity without harm and with more or less benefit.

The harmlessness of this agent when applied with due regard to indications cannot be too fully understood by the medical profession, however some may regard the demonstrated clinical results. It is reassuring to feel that there is no risk whatever in treating a patient whom we may not feel certain of doing decided good, but whom we should be very reluctant to harm in the slightest degree.

For many years statements regarding the dangers of other electric currents have crept into medical literature and serve to influence the majority of the profession to apply the same reasoning to static electricity.

Many of the authors who wrote in former days would now

employ improved apparatus and would revise their statements if they were living.

In a popular work on the subject of electro-therapeutics published in 1888 the author of it refers to the indications for "galvanism" in a certain disease and speaks of "faradism" in the following manner:

> Whenever the mistake has been made of using faradism in ——, serious loss and injury have been suffered. The prime need is for a sedative, and directly opposite in effect is the induced current, which but adds fuel to the fierce flame of disease. It should never be employed in this disease, not even as an application to parts distant from centres.

The lamented author of the work in which this now obsolete paragraph appears was on the point of revising it when he died. *The sedative effects of improved high-tension induction coils represent one of the distinct advances in electro-therapeutic apparatus since 1888.*

I have now a report from a physician who has successfully treated a case of the same disease referred to above with the modern sedative induction-coil current. It ought to be generally recognized that the contra-indications which definitely apply to a particular battery, or current, or dose, or method, or to maximum administrations, may not apply to different currents, different apparatus, and intelligent modifications in scientific electro-therapeutic treatment.

Aggravations by Static Electricity.—Once in a while some writer reports that static electricity aggravates the disease. He means, rather, some form or dosage of static electricity, and generally the spark—which is contra-indicated in conditions in which mechanical violence is contra-indicated, but which is not seldom ignorantly employed, both when it should not be used and in ways that it should never be used; for the spark can easily degenerate from a valuable therapeutic measure into mere brute force.

Moreover, the spark is by no means the whole of static elec-

tricity. I once knew an old lady who was fond of stating that "she did not like fish." She also claimed to "like meat." On careful inquiry in regard to particular kinds of these foods I found that she admitted the ability to eat with relish six individual kinds of fish, and really liked only three different kinds of meat. When the spark is not acceptable with relish (therapeutic benefit) almost the whole field of static electricity is still left from which to choose a form of application to suit the case.

In one of the opening chapters of this book I have shown that a prominent electro-therapeutist of national reputation and since deceased, stated in 1892 that he "had abandoned the static spark as a pain-killer, believing that in a majority of cases, no matter how skilfully handled, it is as apt to aggravate as to relieve."

Such statements mislead the uninformed physician. It is impossible to regard them in any other light than as a declaration on the part of every such writer that he has not carefully studied electro-physiology and the action of the percussive spark, and has not been guided by indications, but has applied the spark without regard to indications. Mere skill in the manipulation of an electrode does not offset the injurious effect of setting up a violent perturbation in tissues that are moaning for soothing rest.

Practically speaking, I never aggravate a patient with static sparks. It is needless. I never fail to advance with caution in the treatment of every state of doubtful pathology, and every strong spark that I administer has had predecessors to make a reconnaissance with milder force. At the first sign of a contra-indication I stop the spark, but I know so well in advance when sparks will do good and when they will not that my experience with even momentary aggravations has become exceedingly limited.

However, when a pathological state protests against a tentative spark, a brief application of the sedative breeze immediately removes the first and last vestige of irritation, and there

ends the aggravation. I cannot conceive the possibility of my persistently hammering away with strong sparks at sitting after sitting upon tissues that were indicating by every possible means they could express the use of some other method.

The therapeutic principles are too simple and clear to justify any such procedure. If the operator errs through ignorance at the outset of his experience, as he sometimes errs in the dosage of drugs, he should strive to learn better by studying the subject.

CHAPTER XXXVI.

PARALYTIC DISEASES.

Wry-neck, paralysis agitans, tremors, etc. Methods for general constitutional benefit in incurable cases. Paralysis. Varieties. Prognosis. The practical results obtainable with static electricity in both curable and incurable cases. Principles of treatment.

Paralysis Agitans.—Static electricity will not cure these diseases under ordinary circumstances, but if the patient's general health is below par and the condition is thereby aggravated, static electricity will always afford the amelioration attendant upon an improvement in health, and in some cases a good deal more.

I have treated an elderly and neurasthenic woman who had suffered from paralysis agitans for thirty years, and whose handwriting was barely legible, and after seventeen administrations of static electricity have seen her improve in general health, regain nerve tone, and write a letter which was about as steady as persons seventy-five years of age in ordinary health would be able to write.

The methods employed and proper in all such cases are simply those which will improve the general condition and relieve any other local symptoms which may exist, pain, etc.

The main part of the benefit is derived from positive electrification, and a tonic breeze to the spine and centres of the cranium. If the arm muscles are flabby and weak from lack of exercise I add slow muscular contractions with an interrupted current for the purpose of increasing the tone of the fibres, and this usually ameliorates in some degree the tremor or agitation.

Paralysis.—The physician has already books upon his shelves which enter into the minutiæ, classification, and sub-

division of the different forms of paralysis. I shall simply attempt here to formulate the guiding principles of treatment which apply to static electricity. No other measures which will benefit the patient should be neglected, and static electricity will not interfere with anything else that is done.

Its function is twofold: to improve the patient's general health if this is impaired, and to assist in restoring the abolished muscle function of contraction.

The second part of its usefulness involves an interrupted current, and there are two forms which may be employed—the static spark and Leyden-jar currents.

The prognosis in cases of paralysis is subject to much greater variety than the methods of treatment.

Paralysis may be due to:

(1) Loss of contractility in the muscle itself.

(2) Loss of cerebro-spinal centre ability to cause contraction.

(3) Interference in the nerve trunk by disease or injury with the exercise of the muscle function in response to the volitional centres.

The resulting paralysis may be complete or partial, and may affect a single muscle or extensive groups of muscles.

With respect to prognosis it may be said concisely that when the loss of power is in the muscles, and the centres and path of conduction are unimpaired, almost every case can be either rapidly or slowly cured.

Something of the results will depend upon the skill of the operator, the faithfulness of the patient in attendance for treatment, and the methods employed. I have seen a case of facial paralysis following a middle-ear operation advance rapidly in my own hands and show more improvement after fifteen treatments than he had obtained from a year and three months of treatment elsewhere with a different current and an aimless method.

In all cases of mechanical injury to the nerve trunk the prognosis will be good if the anatomical integrity of the nerve is

either maintained or can be restored. Any injury which destroys the path of conduction obviously renders a cure impossible. The same remarks about prognosis apply equally to disease of the nerve trunk.

The great class of cases in which many ignorantly and in vain look to electricity for a "cure" includes all those dependent upon injury to the motor centres. What static electricity can do for these forms of paralysis is practical and useful, but not miraculous.

If the patient comes to the office from confinement in the house, with a nervous system shattered by either suffering or anxiety, with muscles wasted by lack of exercise, and the whole body in a weak state, the immediate effects of general positive electrification and mild positive sparks to the spine and muscular surface in general will relieve pain, promote sleep, give passive exercise to the muscles, renew vigor and tonicity, and in two weeks' time produce an apparently remarkable change for the better.

As a matter of fact this simply *begins* the treatment of the paralysis, and it is after this point is reached that disappointment, founded upon a lack of information, ensues. The *patient* has been benefited by lifting his general system up to the level of his actual disease, and treatment has simply removed the debilities of house confinement and his previous sufferings. The actual treatment of the paralysis dates from this time.

The prognosis depends upon three things:

If the central lesion is an effusion which will reabsorb, or an injury which time will make better, the prognosis will be a gradual improvement in proportion as the central impediment disperses. These cases of hemiplegia and paraplegia can be improved with great satisfaction by electrical exercise of the muscles, while, if left to time alone, the paralysis would long linger after the effusion was absorbed.

If the central lesion or injury is of a character which retrogrades, the road before the patient is all down hill, and elec-

tricity can produce only temporary benefit, or assist the patient to be more comfortable if the paralysis is attended with suffering.

If the injury within the head or spine has reached a maximum of damage and thereafter remains in a chronic quiescent state, the patient will, if left to time, witness a very gradual improvement, and perhaps, after many years and a great variety of medical treatment, reach a point where his muscles are useful in proportion to the existing state of the central cells and fibres.

If such a patient is properly treated by electricity before the chronic effects settle into complete apathy far better results can be obtained in much less time.

If atrophy has taken place and is complete, the galvanic current provides much better means of rousing the function of contraction than does the static spark, but in all cases of paralysis the proper thing to do is to find out which current awakens the most ready response and employ it. The applications of galvanism to paralysis are sufficiently well known and these remarks will be confined to static methods only.

The minor forms of paralysis due to cold should be first treated by a warming, relaxing, anti-congestive application of a rapidly interrupted small Leyden-jar current upon the same plan as that which secures faradic sedation with the modern high-tension induction-coil apparatus. Following about five minutes of this application, exercise of the muscles may be gradually developed by interrupting the same current at the rate of about seventy times per minute.

Caution is always advisable at the commencement of each case to avoid overtaxing weakened muscles by too vigorous stimulation. Short sittings, with slow and mild contractions at first, can be gradually increased in the amount of exercise until the muscles endure very thorough treatment without fatigue.

If the paralysis results from lead, gout, rheumatism, hysteria,

syphilis, or any form of constitutional poisoning, the best application is persistent, oft-repeated, and thorough nutritional and alterative treatment with static sparks, together with iodide of potassium, mercury, and other drugs (as severally indicated) to neutralize the poison and eliminate it from the system.

It is, however, often astonishing to witness the improvement in cases of mineral poisoning in patients who attend the clinic and who receive no medicine whatever.

After the first general improvement, in central types of paralysis which will either improve slowly or present atrophies unfavorable to treatment with static sparks, the general administration for nutritional effects should be continued, but the local exercise of the muscles may best be carried on with a slowly interrupted Leyden-jar current and the application of a pair of ordinary moist electrodes.

In some cases this would involve a removal of garments which the crippled patient cannot easily remove in an office, and in these cases substitute methods must be employed until improvement reduces the extent of the crippling and makes more thorough treatment possible.

When the arm is affected it is comparatively easy to bare part of the surface, wind a chain around it, and exercise the muscles by the author's method described in a previous section.

In estimating the value of static electricity in all cases of paralysis it must be remembered that its sphere of action relates chiefly to its influence upon functions and that it is not possessed of properties which will supply new nerve cells, remove a cerebral clot, repair the ravages of a chronic inflammation, cut down excessive formation of connective tissue, or prevent mechanical pressure upon vital structures.

If the treatment of any form of paralysis is undertaken with static electricity, and the patient is able to attend for office treatment, it is certain that there is no stage too early to properly begin. A great part of the damage done to the multitude of cases we see in general practice was done by long waiting

for inflammation to subside and by other delays which put off the application of electricity. The longer a muscle is deprived of its functional activity the more it wastes and the longer it takes simply to regain the unnecessary loss.

In the acute stage of apoplexy from cerebral hemorrhage I would unhesitatingly advise affording the patient the benefit of a daily administration of a sedative, anti-inflammatory, positive head breeze to reduce the cerebral hyperæmia, as soon as he could be safely allowed to move about and attend for treatment. It would also act as a sedative-tonic, and aid in maintaining the tonicity of the entire system, so that when the time arrived for exercising the paralyzed muscles he would have suffered the least possible amount of physical and mental degeneration. Notwithstanding that no opportunity has been permitted me to put this view into actual practice, I nevertheless believe it to be thoroughly advised. I also believe the application of galvanic currents to the head in an attempt to absorb a clot to be fruitless for good and a dangerous practice.

In the latter part of this book will be found the history of a large number of cases of paralysis treated by methods which conform closely to the present use of static sparks. Every physician will do well to study them carefully, but they are not to be considered a criterion of the full capabilities of static electricity to-day. The older electricians did not indeed altogether limit their treatment to the paralyzed muscles, but their apparatus was far less effective than the present large machine is in the great influence upon nutrition and general functional processes which now forms so large a part of the benefit of static treatment.

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CHAPTER XXXVIII.

MISCELLANEOUS CONDITIONS.

Dyspepsia and functional derangements of the alimentary canal. Limitations of static electricity in these cases. Its benefits in nervous and reflex dyspepsias. Cases reported. Conclusions from clinical observation. Acute fluent coryza. Effect of the head breeze in establishing immediate relief. Precautions after static treatment to avoid taking cold. Toothache. Immediate and lasting relief afforded by the sedative breeze. An illustrative experience. Sore and bruised gums following dental traumatism. Relief of pain by the static breeze. Cerebral hyperæmia. Clinical experience with the appreciation of patients who have been treated by static electricity. Lateral curvature of the spine. Methods of treatment. Infantile paralysis. Static electricity subordinate to galvanism. Sprains and contusions. Acute and chronic. Beneficial action of static applications. An illustrative case.

Dyspepsia and Functional Derangements of the Alimentary Canal.—Constipation, diarrhœa, colic, nausea, and pain are all relieved by local static applications as I have shown elsewhere, but curative effects relate chiefly to cases in which these symptomatic disturbances are reflex or functional.

Dyspepsia may be limited to mean nothing more than a troubled action of the stomach, which can be restored to normal by toning up the nervous system, the secretory glands, and muscular fibres of the digestive apparatus. This whole improvement, involving a stimulation of circulation and the re-invigoration of nutritive forces, is well within the physiological action of static electricity.

The direct application of a static spray or spark upon a catarrhal inflammation of the surface of the body will often heal up the process, but such general administrations as can be applied to catarrhal states of the alimentary canal are not effective in curing such a form of dyspepsia. As a rule almost all cases of gastric derangement are treated by other therapeutic meas-

ures, but static electricity will do no harm in any case, will help the majority of cases, and therefore aid the action of other remedies, and in nervous cases it is one of the best possible methods of treatment.

If there are soreness and stiffness in the abdominal muscles, or any reflex or neuralgic pains, these symptoms are quickly removed, with very great satisfaction to the patient. If the digestive trouble is due to a lesion, either more difficult to cure or entirely outside the range of static action, we may greatly reduce the reflex irritability and increase the tolerance of the patient so much that the exciting cause creates far less disturbance than formerly.

Lajoie * published a report of sixty observations of dyspepsia which he had treated by electricity, from which the following is taken:

Case I.—A young man, aged 27, Mr. L——, came to me in 1892, having been troubled for the last two years with more or less heaviness in the head. There was no pyrosis, no gases were belched up. There was no vomiting or nausea. The bowels were regular, though at times somewhat costive. But what the patient came to me was for this, a symptom which I was unable to find mentioned in the books I have read on dyspepsia, viz.: almost every night he felt a soreness over the abdomen. Pressure would neither increase nor diminish the soreness, but change of position would. This would be felt from two or three o'clock in the morning until half an hour after rising. The soreness caused uneasiness and sleeplessness. Meals were taken regularly and did not distress him nor cause any trouble; apparently digestion was good.

After a thorough examination, and I must add some hesitation, my diagnosis was: Intestinal nervous dyspepsia.

After a fourteen weeks' treatment with static electricity he was perfectly well and has remained so up to three days ago, when I last saw him. The positive pole was connected with the stool and the negative used to draw the spark, commencing with the pointed electrode, then gradually coming to the one with the large ball—the sparks increasing in intensity as I went along.

* Journal of Electro-Therapeutics, October, 1895.

CASE II.—That of Mr. S——, 30 years old. After examination and history of the case, I concluded to give him Ewald tests, with salol, iodo-potassium at his next morning's meal, and examine him an hour after. The man was rather thin. After examining the stomach I was surprised to feel the cardia hard under my hand, then gradually that hardness went on as a wave toward the pylorus; one could *see* the peristaltic action of the stomach.

The tests showed retardation of digestion. After ten weeks of electrical treatment the man was well and digestion normal.

CASE III.—Mr. H—— sent for me, August 10th, 1895, for heart disease. For the last three weeks he had been unable to sleep more than a few minutes at a time, his heart *thumped so hard.*

No organic trouble was found upon examination of the heart. Gas was belched up frequently. This patient was living on milk, oatmeal, and the like. I gave him as a diet the whites of two eggs beaten in spring water, five or six times a day. Positive static electricity as treatment was given every day for the first week, then every other day.

In twelve weeks that man could eat and digest steaks, chops, etc., and his heart caused him no more trouble.

CASE IV.—Mr. E——, aged 26. Food takes a long time to properly digest; gas belches up; nausea recurs frequently; no vomiting; bowels irregular; headaches often; pain in the back along the spine, and obliged to urinate very often, but it is painless. Rides the bicycle often.

Faradic current with coarse coil was given, positive pole over the stomach, negative in the lumbar region. I made this patient stop riding his bicycle, and with the electrical treatment he was made well in eight weeks.

I will limit my reading of observations to these, but will now present a few conclusions:

1. In every case of dyspepsia, static electricity will cure or help to cure. Even a case of cancer of the stomach has been greatly benefited by this treatment.

2. Neurasthenia or hysteria manifesting themselves by dyspeptic symptoms are always cured or benefited by electricity.

3. Electricity has the effect of stimulating the general nutrition.

4. It has the effect of correcting any insufficient or perverted innervation of the stomach.

5. Of regulating, first, the action of the glands of the stom-

ach, and second, the hydrochloric acid in the stomach, lessening it when the quantity is too great, and increasing the amount when too little.

6. Give treatments from five to fifteen minutes' duration, beginning with small doses, gradually increasing them as the benefit is greater, until the maximum beneficial dose is reached. The state of the patient being your *meter*.

7. When nutrition is disturbed, electricity has the special effect of bringing it back to the normal, and that result never fails when there is no irreparable anatomical lesion.

8. Electro-therapy, in every disease where the nervous system is a factor, will help greatly, if it does not itself alone affect a cure.

Acute Fluent Coryza.—Seat the patient upon the platform connected with the negative pole. Ground the positive pole and also connect it with the breeze electrode adjusted at a comfortable distance above the frontal region. Maintain the plates in moderate action, or sufficiently fast to produce a vigorous but agreeable breeze. Repeat several times as may be needed.

The serous discharge from the nose will usually stop in a few moments, but the patient should continue the application for at least twenty minutes. If the after-conditions are favorable to prevent a repetition of the cold from exposure after the treatment, one administration is a wellnigh infallible cure, as I have observed for a number of years in my personal experience and as it was stated to be by the electricians of the last century.

Precautions after Treatment.—Some physicians keep their office very warm and some patients wear very warm clothes. When these conditions are combined with an energetic application of static electricity a sensible perspiration is set up and should be allowed to subside before the patient goes out into an atmosphere which is liable to cause her to take cold. Aggravations sometimes occur from this cause and especially when the patient steps from the office to a street-car and is subjected to draughts. Ten minutes of rest in the reception-room is a wise precaution in every case in which perspiration has been induced.

Toothache.—Seat the patient upon the static platform with

connection to the negative prime conductor. Ground the positive pole and the brass point electrode and apply a strong, sedative, positive spray to the area of pain upon the side of the face. Apply the same principles as in treating ordinary neuralgia of the face. It would hardly be expected that this would give more than a few hours of relief to the pain of a carious tooth, and it was so stated a hundred years ago by the men who employed it then. I am not a dentist, but when a tooth is decayed so badly that the end of a lead pencil could be inserted in the hole the fact is sufficiently apparent to my eye to leave little doubt in the matter.

Some three years ago a cook in my household had two or three such teeth which gave her a great deal of trouble. She had a natural horror of our dental friends, and could not be induced to have the tooth repaired until it set up such a paroxysm of ache that she at last consented. As she was in too much agony at the moment to endure the thought of going alone I applied a positive spray to the side of the jaw for about fifteen minutes.

As the pain completely ceased she changed her mind about the dentist and said she would wait until the tooth hurt her again. This did not happen until three months later, when the same process was repeated. She was in my employ for two years, and in this case and others I have found the relief afforded by the static breeze surprisingly permanent in some very badly decayed teeth.

Sore and Bruised Gums Following Dental Work.—In some half-dozen instances patients of mine have happened to come directly to my office for treatment after leaving the dentist. Sometimes the process of filling a number of teeth has produced a general ache. Sometimes one, two, and in one case six teeth have been pulled out, leaving the gums in an intensely painful condition. None of these patents had received any local sedative from the dentist, but were sent home to let time heal the wound.

The positive breeze directed carefully upon the gums has in every case produced a state of comfort, and at the same time tranquillized the entire nervous system. No one who has not personally experienced the relief afforded by this simple application could credit the change it makes. Of course no electrical current which requires the contact of electrodes could help these cases, nor is any anodyne or mouth wash quite comparable to static in its effects.

Cerebral Hyperæmia.—The relief of this condition is afforded by the same means as the treatment of congestive headaches. If, in these cases, the scalp is very sore and tender, and even the weight of the hair is felt to be an intolerable burden, the positive static head breeze will produce immediate beneficial effects. Frequency and repetition of the treatment must be governed by the intensity and persistence of the hyperæmia.

Clinical Remarks about the Appreciation of the Patients.—In my experience in the practice of medicine I have observed no other branch of practice in which expressions of appreciation and wonder are so often spontaneously made by patients during treatment as in the field of electro-therapeutics. It is true of all currents, and especially true of a well-handled static machine.

Almost every report made by different writers remarks the same fact. Many of the expressions of patients would be regarded as the extravagance of hysterical enthusiasm by sober-minded practitioners accustomed for years to dispense the routine remedies of the materia medica. They often excite ridicule among persons who read the printed remarks and are totally uninformed about the cause of the sufferer's gratitude.

To every one, however, who has long operated a static machine these expressions from patients who have entered the office in a miserable state and have gone out with a light-hearted sense of comfort become commonplace and routine. They excite neither surprise nor comment, and the few that are

reported are very much short of the thousands that are not reported.

The reluctance of the individual mind to admit that any medicine does any good is well known, and is encouraged by statements from teachers high in authority who seem to have no confidence whatever in any branches of medicine except surgery, pathology, and diagnosis. *Therapeutics*, however, must come in somewhere or the medical profession has no ground to stand on, and static electricity is one of those Napoleonic and masterful therapeutic remedies which emphasizes its benefits in an unmistakable way.

This book, however, omits everything in the way of an attempt to repeat any of the remarks which patients are accustomed to make after some extraordinary symptomatic relief. The basis of confidence in static electricity is a careful study of its physiological actions rather than the remarks of the laity.

Lateral Curvature of the Spine.—A sufficient number of static sparks to produce satisfactory results in exercising and toning up the deficient muscles in this affection would be annoying to the patient, and a better way is to produce regular muscular contraction by a slowly interrupted Leyden-jar current.

A well-moistened sponge or felt covered electrode about the size of the palm may be maintained by the patient upon the abdomen, while with an ordinary hand electrode the operator exercises the entire muscular area of the affected side, upon the general principles involved in the treatment of all forms of paralysis.

The abdominal electrode may be connected with the positive Leyden jar, the interruptions adjusted to about seventy per minute, and the current strength made sufficient to first cause very mild contractions, and gradually increase to cause more vigorous and powerful effects, as the muscular fibres increase in both strength and endurance.

When the affection is limited to the muscles only, this is

the best method of treating lateral curvature. It can be supplemented by any reasonable forms of exercise, and other measures directed to improving the general health. Static is *facile princeps* in these cases.

Infantile Paralysis.—When this is of the form which follows poliomyelitis, and the leg muscles, for instance, below the knee are completely atrophied and will not contract to an induction current, the treatment of the paralysis must be begun and long continued with galvanism.

While, however, static electricity will do little or nothing for the atrophied and useless muscles, it will give passive exercise to the muscles above the knee if they are not paralyzed, and to the muscles of the other leg, and increase the control of the patient over the limbs. As this exercise can be readily given with a few static sparks and general improvement promoted by local applications to the spine without removing any of the clothing, it is often a very useful procedure. Static electrification will also do much to improve the general health.

Sprains and Contusions, Acute and Chronic.—If the static application can be applied immediately, the repair of the tissues, in even very severe cases, will be greatly hastened. Insulate the patient with the negative pole, ground the positive pole and the brass point electrode. Sweep the point gently over the uncovered skin of the injured part at a distance of a few inches so as to give a strong spray. This will instantly remove the sense of heat, pain, and tension; it will reduce the swelling and produce comfort at once.

I have had no opportunity to judge what the full capabilities of this treatment would be if it could be repeated often enough to maintain the good effects. Unquestionably, however, no other means in the hands of the surgeon can approach the static breeze in the kind and quality of work it does in these cases.

If the patient goes home and does not have more than the first treatment with static electricity the subsequent management of the case upon ordinary surgical principles will be

greatly facilitated even by the single treatment. If she returns from time to time the reparative processes of nature can be advanced, and subsequent stiffness of the joint removed, more satisfactorily by electricity than by other means. The following is a recent case which illustrates the value of both X rays and the static breeze and spark:

Mrs. ——, aged 45; weight 180 pounds. Under treatment for chronic articular rheumatism of the hip-joint which she has had for eleven years. On December 30th, 1896, while on the way to my office she stepped from a street-car upon a treacherous pile of snow, which gave way beneath her, and in attempting to save herself she fell with her entire weight directly upon the thumb, which struck the ground upon the end.

Although a stout, muscular woman, she was so severely bruised by the hard fall that she was unable to proceed for half an hour. When examined, the thumb was already much swollen, acutely painful and throbbing, very hot, and discolored around the middle joint, which was almost "telescoped" by the force of the blow. The end of the thumb was bruised to a pulpy state but the skin was not broken.

A positive static breeze continued for about ten minutes entirely removed the heat, throbbing, and pain. It stopped the whole inflammatory process, reduced the swelling, and restored comfort.

An examination with the fluoroscope showed that the bones were intact. As she lived a distance from the city she was given a sedative lotion and sent home to her family physician. The thumb was so badly injured that he suspected some splintering of the bone of the second phalanx, but she confidently disputed his diagnosis with the statement that she "had seen the bones herself with the X rays and they were all right."

On the 2d, 6th, 8th, and 10th of January she had other static applications upon the thumb, which was rapidly undergoing improvement. No very severe pain returned at any time and each application removed whatever pain was present. The effect of the spray in restoring circulation through the injured vessels was very marked. No part of the thumb became black and blue, the numbness and stiffness were about all that needed treatment after the first two weeks, and a few mild sparks had good effect upon these. In less than two months from the time of the injury she ceased to pay any further attention to the thumb.

CHAPTER XXXIX.

MISCELLANEOUS CONDITIONS.

Locomotor ataxia. Static electricity treats the patient rather than the disease. Its great practical usefulness. Principles of treatment. Static electricity probably the best single remedy for general effects. Treatment of symptoms. Selection of indicated methods. Routine treatment avoided. Treatment for different stages of the disease. Prognosis. Functional derangements of the genito-urinary organs in the male. Static electricity as an adjunct to local treatment. Static electricity in infancy and childhood. Clinical case of infant seven weeks old. Clinical case of infant eighteen months old. The power of static electrification to arouse functional processes.

Locomotor Ataxia.—Static electricity can hardly be said to treat locomotor ataxia. *It is, however, of great efficiency in the treatment of a patient who has this disease.*

I believe it to be of much greater efficiency than writers accord it, but I refer to static electricity as a whole, with *all its therapeutic and physiological resources,* in the hands of one who applies it according to its indications, instead of the perfunctory routine of static sparks.

If the possessor of every Holtz apparatus in this country was properly instructed in the technique of static administrations and exercised reasonable judgment in considering the indications for different methods, it is probable that many more cases of locomotor ataxia would receive substantial instead of merely temporary benefits.

In order of importance the treatment of this disease is based upon the following measures: "(1) Rest; (2) nutrition; (3) removal of reflex disturbances; (4) drugs directed against the lesion."

Static electricity comes very near to covering the last three

of these indications, except so far as specific medication may be required for a specific cause of the sclerosis. I leave to others, however, the theoretical discussion of how best to "cure" this frequent disease of the spine, and will simply state the manner in which I treat patients who come to me suffering from locomotor ataxia.

Most of the patients who finally reach the office of the electro-therapeutist are somewhat advanced in ataxia and have already decided that medical treatment could not cure them.

If there is no specific history there is almost no occasion to prescribe other drugs, and I depend entirely upon galvanic and static treatment, with ordinary personal hygiene. It appears probable that at some stage of the processes within the spinal cord the galvanic current may accomplish what static electricity certainly will not; but it is hard to decide what goes on in the spinal cord.

For the relief of symptoms, and local and general nutritional effects, my main dependence is static electricity, and patients learn to look to it with more confidence than to any other form of treatment they have ever received.

It may be said in passing that the clinical history of some ataxic patients shows a wide range of experience in the hands of different neurologists, and some of them become very expert in deciding what makes them feel better. It is very rare to find an exception to the rule that static electricity holds the first place in their affections.

Omitting references to methods of applying other currents I will proceed to static electricity, and say that there is no stage of the disease in which it is contraindicated, or in which it cannot contribute something to the patient's comfort. Although I follow no routine, but meet the condition which each patient presents as seems to be indicated at the time, it is necessary to write of the matter in some systematic way, even if this involves arbitrary division of the disease into theoretical stages.

Whatever symptoms present themselves in the first stage of locomotor ataxia, which is presumably limited to congestion and other changes which precede the sclerosis, they should be treated upon the same principle that the same symptoms would be treated in any case not locomotor ataxia. The spine is not to be thumped indiscriminately with powerful static sparks because the diagnosis points to this disease.

One of the best methods of treating congestion and advancing stages of inflammation is the sedative spray. Peripheral applications of the spray, mingled with mild sparks from the brass point electrode, will do a great deal to relieve pains which are associated with conditions which call for sedation rather than the mechanical violence of the percussive spark.

It is in more advanced conditions of sclerosis that sparks to the spine are indicated, but the whole treatment of locomotor ataxia with static electricity practically resolves itself into treatment of symptoms and endeavors to maintain functional processes and nutrition.

A promise to cure the disease must be left entirely out of the question; but in saying this I do not mean to imply that any other agent administered for the same ends would accomplish more. *Posture during treatment is important.*

It naturally follows that the operator who expects to produce satisfactory results with this class of cases must understand all forms of technique and know when to apply them.

When the spinal condition is recent and requires sedation the breeze is indicated. When it is chronic and needs stimulation, a stimulating breeze, spray, and spark present different modifications for use. If the head aches, the positive breeze will remove it. When the organs of the trunk are severally involved, the same principle of spray sedation (if muscular soreness, tenderness, or other signs contra-indicate the spark) applies to them; while if the condition is chronic and needs stimulation the spark is well tolerated and beneficial.

Some patients have scarcely any pain at all, and some find

pains their chief trouble. If these pains are burning and throbbing and originate at any definite point, I concentrate a good deal of spray in the indicated locality before using sparks. If the pains shoot from place to place and have no settled habitation, their relief goes along with the general nutritional treatment which is the main part of every sitting.

This treatment embraces the whole nutritional resources of static electricity as described on another page, with the particular addition of an extraordinary number of sparks upon areas of numbness, pain, or anæsthesia, including the soles of the feet.

What would be intolerable to an ordinary patient will only initiate an agreeable sensation to the ataxic individual, whose legs below the knees are heavy and numb.

It is considerate, in all cases, to begin every powerful spark treatment with a preliminary warming up with milder measures, for when the circulation is well established and the patient composed by a few minutes' rest on the platform he will be better prepared for energetic measures.

In every case it is my custom to advance to powerful sparks only after the tentative employment of milder measures, and by this plan I am enabled to say that I have never aggravated the symptoms, irritated the patient, or made him less comfortable.

On the contrary, it is the rule that the patient sleeps better, feels a decidedly beneficial muscular reaction and steadiness, maintains a greater degree of comfort, and does not appear to go down hill so rapidly; he is inclined to think that static does him more good than anything else he has ever tried; he may even for an indefinite time improve; the process may seem to be arrested; he may seem to be cured; in some cases he is finally able to go entirely without treatment for several months or even a few years; in other cases he is only able to keep fairly comfortable when he takes static regularly at greater or less intervals, sometimes once a week, sometimes twice or three times a week.

In other cases (and these are a small minority) the patient is a negative sort of individual who thinks nothing ever does him any good, and after a little while he drops static also.

The effects of specific medication are too well known to need mention here. One of the chief difficulties in estimating the value of static electricity in chronic cases of this character is the fact that patients are often treated at wholly inadequate intervals, with more or less irregularity, and sometimes by inadequate operative skill. Nine-tenths of all that appears in medical literature about either the uses or limited value of static electricity in locomotor ataxia may be rejected by the physician of to-day who possesses an improved Holtz machine and who knows how to use it.

Functional Derangements of the Genito-Urinary Organs in the Male.—It is sufficient to state that in this class of cases static electricity will either act as a sedative nerve tonic, or a stimulating nerve and muscle tonic when either the local or general condition indicates such measures.

The mental condition of patients who brood over their trouble will be greatly improved, and in cases which are either functional or organic, static electricity will prove decidedly useful if the general health is below par, as it usually is.

In addition to other forms of administration, which would follow ordinary rules, the single special method requiring mention is sparks to the perineum. These require some little knack to administer, and for this purpose the spark electrode enclosed in glass is useful although not absolutely necessary.

Static Electricity in Infancy and Childhood.—The diseases of children which do not belong to the epidemic affections or to the acute inflammations are for the most part of a functional nature. In the latter class of cases children are susceptible to improvement by the action of remedies which regulate the functions and improve nutrition.

It is not my intention to suggest any substitute for ordinary medical procedures, but there are times when the mother is

very anxious, and the physician would not intentionally deprive her of any remedy which would help her child. In marasmus and conditions of extreme prostration, hyperexcitability or dangerous apathy of the nerve forces, the static machine may be a boon in thousands of cases. The tonic effect of seashore air to children who are prostrated with summer heat in the city is not more pronounced and decisive than the benefits of positive static electrification.

A child of any age above a couple of weeks old can be safely held upon the static platform in the arms of either a nurse or the mother and subjected to general electrification without alarm or conscious sensation of any kind, and without undressing. The mother's feet should rest upon the metallic foot-plate connected with the positive pole and one hand should hold the bare hand of the baby, so as to make direct connection without intervening resistance. If the child is held around the body and outside the clothes the current will pass through to the infant in the form of a small spark, and probably result in tears.

H. B——, aged 7 weeks, bowels loose, has been very ill; bottle-fed baby; has had acute diarrhœa for three days; will not sleep, cries all the time, and the mother is greatly alarmed. Medication has failed to establish an improvement.

September 11th, 1896: The mother held the child upon the static platform and both received ten minutes of positive insulation. On the 14th she came back reporting that the child had slept three hours immediately on returning home, and had since been quieter and the diarrhœa had ceased. On the 16th the child was seen to be improving rapidly with no other treatment than static electrification, of which three treatments had now been administered. The external application of cod-liver oil was begun, with an internal auxiliary remedy, and under the joint influence of these and two more static applications the child improved considerably.

The baby weighed nine pounds at birth and only ten pounds at eight weeks old. On October 2d he was brought to the office again and showed signs of intestinal irritation. Both mother and child were given fifteen minutes of positive static electrification and a change was suggested in his diet, since which time he has grown well and hearty. The efficacy of the

static administrations in arousing the nutritive processes is certainly useful in all such cases. The mother was also very much run down, and it was as much benefit to her as the child.

Upon the first visit the baby cried continually and was almost uncontrollable at first, but quieted down a good deal under the soothing influence of the current. At subsequent visits he was perfectly quiet and showed the usual appreciation of the static machine.

L. H——, 18 months old, has been sickly for a long time. Her mother has had four previous children and never succeeded in getting any one of them past the age of one year and one-half. The baby was extremely emaciated and the cachectic state was considered due to worms. The mother was frightened and crying from the belief that her child would soon pass away, and both were put upon the static platform connected with the positive pole. This was at the beginning of February. Medication was of course prescribed for the case and the mother instructed to examine the stools. Nothing was discovered to confirm the diagnosis, and the remedies were changed to cod-liver oil externally and a simple aid to digestion. After the first administration of static the child immediately ceased to get worse. She was treated only three times a week during the month of February, 1897, and before the middle of March has now become a comparatively active and hearty child.

When static electricity is administered to infants they often sleep during the entire process, especially after the first sitting. If the current was administered every day for a time it would probably do them much more good, but if it arouses a reaction even when administered at longer intervals, and enables other remedies and home treatment to attain their desired results, it is worth employing.

It appears to me that in desperate cases it would often turn the tide in the child's favor by its undeniable restorative action upon the forces which energize the vital organs and carry on the processes of nutrition.

CHAPTER XL.

STATIC ELECTRICITY IN GYNECOLOGY.

Its local and general usefulness. Amenorrhœa. Method of static treatment. Chlorosis and anæmia. Method of treatment. Relief of symptoms and neurotic disturbances in these cases. Static electricity and menstruation in general. Menstruation not a contra-indication for sedative forms of treatment. The benefits of general electrification in mild cases of dysmenorrhœa. Cervical and lumbar backaches of women. Static electricity almost a specific remedy. Methods to employ in treatment. Gynecological wrecks. "Nerves." The effects of general electrification. Static electricity in puberty. Static electricity in pregnancy. Its great value to relieve the symptomatic disturbances during gestation. Contra-indications considered. Convective-discharge methods always harmless during pregnancy. Mental states. Clinical experience with the beneficial action of static electrification during the entire progress of pregnancy. Static electricity during the menopause especially indicated in this state of functional derangement. Its superiority to drug sedatives. Clinical remarks upon practical methods of treatment. Uniform efficiency of apparatus essential to uniform results. Three tests for determining the normal maximum of current from any static apparatus.

No attempt will be made in this section to suggest the uses of static electricity in every separate lesion of the pelvic organs. It treats the patient rather than the disease, and the indications for its use do not follow classical nosology, but appeal to the eye of the operator when he examines the case or present themselves in the history.

Sound general health is rarely associated with chronic disease of the uterus. If any patient is below par she needs general as well as local improvement. As an auxiliary to the pelvic uses of galvanic and faradic currents, the nutritional and tonic effects, the sedative nerve-composing, pain-relieving, and muscle-strengthening properties of static electricity are invaluable to the patients of the gynecologist.*

* As is well known the indispensable currents in the local treatment of pelvic disease are those obtained from high-tension induction coil and galvanic appara

In the backaches of women, in simple dysmenorrhœas, at puberty, during gestation, throughout the menopause, in neurotic disturbances, neuralgias, headaches, cold extremities or hot flashes, prolapse, endometritis, fibroids, with all their pains and reflex symptoms, in the anæmias, neurasthenias, and dyspepsias of these states, static electricity will add immensely to the benefits of local treatment, and single-handed will provide an amount of comfort for invalid womanhood which medical means could not equal in any other single way.

When it is a nerve sedative it is not a depressant of nerve force; when it relieves pain it does not cut down vitality or engender a narcotic habit. When it tones up the strength it does not awaken an insidious appetite for stimulants.

It can deal with a dozen symptoms as well as with one, and obviates complications of medical prescribing; and inasmuch as no disrobing is required the satisfactory therapeutic result obtained by static electricity in the states which accompany the pelvic diseases of women is reinforced by the facility of its administration. It speedily gains a prominent place in the grateful regard of invalids who have enjoyed a veteran's experience with other procedures of gynecology.

Amenorrhœa.—In its simplest form, in girls whose functions have delayed maturing, in chlorosis, spinal and pelvic anæmia, and in general when there are no evidences of a local pathological condition, when examinations and topical methods are undesirable or are refused, and when the encouragement of menstruation is not contra-indicated, the treatment may consist in simply restoring the general state of the health, and when this is done, a few static sparks may be applied to the spine and ovarian regions. When the state of health is prepared for the absent function the stimulation of the spark to the nerve centres and muscular fibres restores it.

tus. The most approved and useful methods of employing these currents in gynecology are fully described in the author's work upon "The Treatment of Disease by Electric Currents." To the local action of the primary methods the general nutritional action of static electricity renders it a most valuable adjunct.

In the interesting cases collected in the second section of this book the necessity of improving the general health before stimulating the function is clearly set forth in the reports of electricians of 1840–50, but in those days they were less able to contribute general nutritional effects with their static machines than we are at the present time. The present dependence upon internal medication is therefore much less, and the static application can accompany the case from the beginning to the end with decided advantage.

Seat the patient upon the static platform and administer positive electrification for about eight minutes. Stop the machine, change the platform connection to the negative pole, and ground both the positive pole and the brass point electrode. Administer a tonic positive spray to the spine and over the lower abdomen for five minutes. In chlorotic, cachectic, and depraved states of health requiring prolonged constitutional upbuilding this treatment may be repeated three times a week for a couple of months, in conjunction with any remedies that may be judiciously prescribed.

As soon as the patient will accept mild sparks to the spine and ovarian region they should be applied at the close of each *séance*. In cases not requiring sustained and regular treatment, and in the latter portion of the care of those who have received sufficient constitutional improvement, the static application may be limited to daily sittings three days before the expected flow.

Before the development of the high-tension induction coil, and the improved galvanic and faradic methods of Apostoli, the static spark was *facile princeps* in the realm of electro-therapeutics as a regulator of the menstrual function. It is as efficient to-day as it ever was, but it has been for the most part superseded by methods which are better in many cases, and yet it may be employed if desired in a large number of cases when only a local stimulation is required and when the exposure of the person for more direct treatment would be refused.

Chlorosis and Anæmia.—Prescribe in the usual manner for these conditions, but when it is practicable to do so, the return of health and normal functions may be expedited by the general and local use of static electricity. These cases are sometimes very nervous and will require gentle management in the beginning.

Seat the patient on the platform positively insulated. At the first few sittings administer positive electrification alone with the negative pole grounded for fifteen minutes. As soon as timidity is allayed, add to this the positive spray for three minutes.

After one or two more treatments nervousness will have been replaced by confidence, and mild sparks around the lumbar and ovarian region may complete each *séance*. Applications should be at least three times a week regularly, and daily for three days before the proper time for menstruation.

When the approaching flow creates neurotic disturbances, headaches, etc., without positive dysmenorrhœa, the static application will relieve them entirely. This is the most suitable form of menstrual stimulation in chlorotic girls, as no delicacy is sacrificed and the patient need not even be aware of the expected action of the sparks.

Static Electricity and Menstruation in General.—When patients are undergoing a course of treatment by static electricity for some chronic affection, perhaps entirely disassociated from any pelvic cause, they may ask if treatment should be stopped during menstruation. Static sparks are usually not well borne at such a time, and practised operators make it a rule to omit them; but as the mild head breeze and simple electrification are not only peculiarly grateful to menstruating women, but afford relief to much of the irritability or even dysmenorrhœa which arises chiefly from ill health, it is beneficial and desirable to continue modified treatment during the period.

As no disrobing or exposure of the patient is required in

static electrification, questions of delicacy do not enter into the consideration of the case.

Cervical and Lumbar Backaches of Women.—If there is in the whole range of medicine an unfailing balm to the woman whose back feels as if it would "break in two" it is the electrical current generated by the Holtz apparatus.

Whether the ache is high up or low down, is mild or severe, is recent or old, is superficial or deep, is sore and tender to touch so that she can hardly wear her clothes, or is of the opposite character, I want no other remedy than electricity in some form.

The first, simplest, and unfailing remedy for recent pains of congestion or fatigue is the static breeze. To older and more obstinate cases add the mild spark or counter-irritation.

There are few women who do not have backaches at some time. There are still fewer women who cannot obtain prompt and efficacious relief from selected forms of electrical applications. If the breeze and spark fail to do well in an inveterate and deep-seated case there is still left among the resources of the static machine the rapidly interrupted high-potential small Leyden-jar current which will handle the remainder of the cases.

Gynecological Wrecks.—Some years ago women encountered a panacea for the cure of their infirmities of whatever sort, from neuralgia to epilepsy. The result has put into our hands an army of women without ovaries, but with a nervous system with an unimpaired capacity for getting sick and feeling miserable. The reflex symptoms of disturbance are often about as great as they had been before the cause (?) was removed.

It is a thankless task, wellnigh beyond the powers of safe remedies, to follow these neurotic symptoms and give satisfactory relief. Drugs which are cruelly deceptive in their palliation of neuroses are too often injurious in ultimate effects to be long continued. Between bipolar faradization and static

electricity relief can be afforded to patients of this kind who would otherwise drift hopelessly along in a pitiful and despondent state.

"Nerves."—Either about the time of an approaching period or when subjected to some social or domestic strain, an otherwise well woman is apt to feel "all nerves, and as if she must fly," while the jaded head of a large family may almost feel desperate enough to "run away and never return."

Seat such a woman in a reclining-chair upon the static platform. Connect it with the positive pole. Ground the negative pole and request her to close her eyes and compose herself for a siesta. Start the machine into a sufficiently rapid action to maintain a vigorous current for fully twenty minutes, and the nervous system will be called away from its distractions and receive a new invoice of strength and rest.

If the patient has been treated before and is accustomed to the method, she will also desire a refreshing spinal breeze. If she is in ordinary health this single administration will suffice for another month or until she gets out of sorts again. If she is worn out with household cares a couple of months' regular and frequent treatment by the same method would cost her husband a great deal less than a trip to Europe and would do her about as much good. Potential alternation is a superb remedy also for these cases.

Puberty.—It is self-evident to any one familiar with the physiological action of static electricity that when either girls or boys are maturing with tedious delay, and especially when they have just suffered from some prostrating acute illness and convalesce slowly, scarcely any other agent would do them an equal amount of good. We need not dwell on this point. It is simply a question of suiting the method to any given patient's needs.

Pregnancy.—Is this state a contra-indication for static electricity, or has this agent a comforting hand to hold out to the physiological invalid who is suffering from gestation?

The facts negative the first part of this question and reply in the affirmative to the second.

In the first three months of pregnancy I regard the sedative tonic effects of static electricity as not contra-indicated in any reasonable form of administration which is necessary for the treatment of other conditions of the patient.

All administrations of static in the form of general electrification, breeze, and spray are safe and beneficial at all times during the entire course of pregnancy, whenever and wherever they are needed. They cause no muscular contraction, and no untoward occurrence that might appear to be coincident could be attributed to them.

Powerful sparks in the region of the pelvis would not be applied during any stage of pregnancy except for good cause by one accustomed to every phase of static electricity, although as a matter of fact I have never seen them do any harm in any case, nor do I believe that it would be possible to produce a miscarriage by rational therapeutic measures with this agent. Sparks may be applied to the rheumatic joints, myalgic muscles, and neuralgic pains with the same good results and absence of harm that they are applied to non-pregnant women.

Static electrification, positive or negative, and the positive breeze and spray, are not only as safe and beneficial as sleep itself when they are indicated in pregnant women, but more than any other sedative-tonic within the range of medicine a skilfully handled static machine will conduct them comfortably through the functional disturbances of gestation.

The head breeze will remove for the time any headache that does not demand mechanical support to a dragging uterus for its relief. The mental states are comforted in the same way. The backaches are wholly removed as often as they recur by the spray and mild spark. Nausea often vanishes during general positive electrification and especially after a positive breeze over the region of the solar plexus. General nervous disturb-

ances are controlled in the same manner, and for some time after such a treatment the patient feels like a new being.

I have seen a woman in the third month of pregnancy step upon my static platform in such a state that it would be the despair of a medical prescriber to select a remedy that would enable her to become fairly comfortable without regard to time. In fifteen minutes she has spontaneously declared that she "felt made over new," had lost the nausea, repugnance at the mere thought of eating, severe lumbar pains, numbness in both upper and lower extremities, headache and depression in spirits, creeping chills, and has gone from the office directly to the dinner table and enjoyed a hearty meal.

Such amelioration is not limited to a few moments after the treatment. It sometimes lasts but a day, while in other cases the patient continues to feel comfortable for one or two or more weeks. But after one experience with such an agent, with its demonstrated power to comfort her condition, she never again fails to turn to it for relief when occasion requires.

If frequently administered during the latter part of gestation it will act as an efficient tonic and nutritional stimulant, and aid in meeting the trials of parturition with unshattered nervous forces and unimpaired muscular strength.

In relieving the pains, discomforts, and conditions which interfere with nutrition and sleep in the last month of pregnancy the static machine does for a suffering woman what nothing else can do to tide her over the crisis.

It is well to say also that electrical tonic sedation often so far outclasses the effects of bromides, and other hypnotics, anodynes, and sedatives as to displace entirely their routine use in the practice of the owner of a static machine, to the unspeakable benefit of his patients.

The Menopause.—To one who has never personally witnessed the benefits bestowed upon women during the neurotic disturbances of the menopause the verbal recital of the action of static electricity upon this state would seem like gross ex-

aggeration. It is a "state of disordered function," and every physician should carefully read the physiological action of static electricity upon functional derangements of the system. There will then be no occasion to charge any one with extravagance in reporting his clinical experience.

The general depression of the system caused by an attempt to subdue the neuroses of the menopause by the prolonged administration of bromides is an opprobrium upon scientific medicine, and the attempt to select remedies upon symptomatic indications often keeps both the physician and patient busy.

In many cases, however, the unfortunate woman either thinks that nothing can be done for her relief (and she accordingly endures her condition with what fortitude she can), or else her doctor prescribes a palliative and advises her that time alone will bring her permanent relief.

The fact should certainly be known to every member of the medical profession that this class of cases is distinctly within the chief sphere of action of sedative-tonic and function-regulating static electricity.

It is at this time of life again that mild static sparks around the pelvis have an effectual influence in regulating the declining menstrual function, just as they effectively regulated the commencing activity in puberty.

To recite the other capabilities of the different forms of application would be to narrate in detail every nervous, muscular, and functional disturbance of this period of a woman's life; for static electricity will relieve them all, will direct into normal channels of action the unsettled activities of sympathetic and cerebro-spinal nerves, and conduct the woman through and out of the season of the climacteric in a rational and satisfactory way.

To the operator who understands the management of his apparatus, the Holtz machine dispenses at once with many other agents of the materia medica for the functional derangements

of this stage of life, and not only surpasses them singly but collectively in value.

Standard Current Tests.—The basis of this book is the author's clinical experience. Part of that experience was acquired with a six-plate, twenty-six-inch Holtz machine, and part with an eight-plate, thirty-inch machine. In both cases the therapeutic value of static electricity is the same, for it is not the apparatus but the operator's use of the apparatus which performs the work.

It will be observed that no attempt is made throughout this volume to direct every possible variation in the treatment of each disease. The chief principles of treatment are clearly outlined, and to elaborate and describe a dozen other mechanical manipulations of electrodes would be superfluous. The expert will always develop individuality in the technique of his chief methods.

Owing to the fact that the name of a disease furnishes little idea of the general state of the patient when first seen in the office, it is out of the question to lay down fixed rules. I have made an attempt in the foregoing pages to assist the general practitioner with practical clinical information, but it by no means follows that the methods described are always applicable.

On the contrary, I unhesitatingly set aside everything in the way of rule in the presence of the clinical facts of the patient's actual condition, regardless of the name of any disease whatever.

My therapeutic methods are based upon the treatment of the patient, in accordance with local and general pathological or symptomatic indications. I accept no other guide, and look for results to direct both the regulation of the dose and the frequency and duration of treatment.

It is essential that those who follow my teachings should approximate as nearly as possible the same efficiency in the working capacity of their apparatus which I maintain.

I have frequently observed static machines similar to mine

in other offices working at a reduction of twenty-five, fifty, and even seventy-five per cent of their normal maximum. Owners have not seemed aware of this until it was pointed out. Tests of the matter are simple, and each reader can determine for himself how far his current efficiency differs from the maximum. The current may be wasted in either of three places: inside the case, between the poles, or on the platform.

Test 1. If the machine develops high internal resistance, jumps a spark between a comb and collector when in very rapid motion, with the negative pole grounded and the positive pole connected with the platform, the production of current by the machine and within the case is at its maximum.

Test 2. Short-circuit the sliding poles, start the machine into rapid action, and draw the poles gradually apart. This test should be made in a darkened room. If the convective discharge holds between the balls of the sliding rods until the distance between the poles is within a couple of inches of the radius of the plates, and if, when the luminosity divides, the "fox-tail brush" stands out in well-defined and splendid radiance from the positive pole, with little or no leakage elsewhere, there is no waste worth speaking of at this very important part of the machine.

Every physician should test his apparatus in this manner. If the brush discharge refuses to form the "fox-tail" appearance, or rather an appearance which more resembles the ordinary whisk broom with its short handle, and jumps across an air gap of only four, six, or eight inches, the output of the machine is wasted somewhere else, if the first test shows that current is generated in abundance inside the case. The place can be detected by the eye in a dark room.

Test 3. With the negative pole grounded and the positive pole placed as usual in connection with the platform on which the patient sits, start the machine into rapid action and request the patient to approach the hand near any part of the platform rod.

If before the hand actually touches the rod a spark passes, the length of it will determine the amount of current waste. As the resistance of the air is very great a very short spark will indicate some waste, and a spark only a quarter of an inch long would indicate a great deal of waste, with a corresponding reduction of the therapeutic efficiency of that operator's work, no matter if the machine itself was the most powerful and finest ever made.

When a patient upon the platform connected with my own machine performs this test, there is absolutely no sensation of the slightest spark discharge between the rod and the hand. This shows a complete elimination of resistance in the external path of the current, and supplies within the patient the maximum output of the machine at any rate of revolution desired.

It is essential to make this plain, for all terms of description have relative meanings, and must be interpreted upon a uniform understanding or results will differ. The terms "mild spark" and "strong spark," for instance, may convey to different minds as great a disparity of actual measurement as the terms mountain and hill would convey to the dweller in the Alps and the inhabitant of the prairie. Unfortunately there are no mathematical forms in which to express the dosage of general electrification and localized methods, but under the teachings of experience and careful study it is reasonably certain that all operators can attain sufficient proficiency for valuable therapeutic work with the static machine, if they will keep it in good order.

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